



**Underwater Inspection of
SH 100 over the
Arkansas River**
Muskogee County, Oklahoma
October 14, 2022

Structure No. 5159-0300-X
NBI No. 17611



To: Leslie Lewis, P.E.

From: Consor Engineers, LLC

Date: December 9, 2022

Subject: Underwater Bridge Inspection
NBI 17611, Structure 5159-0300-X, SH 100 over the Arkansas River

On October 14, 2022 as part of CI-2348 Underwater Bridge Inspections, an underwater inspection of the above-referenced structure was performed in Muskogee County.

The inspection was performed by the following personnel:

| | |
|---------------------|------------------------------|
| Michael Dukes, P.E. | Team Leader/Diving Inspector |
| James Talacek | Diving Inspector |
| Colt Powell | Diving Inspector |
| Matt Ratliff | Diving Inspector |

The bridge is currently open to traffic with no load restrictions.

The current NBI ratings for this structure compared to the last inspection are as follows:

| NBI Item | 2022 Rating | 2017 Rating |
|------------|-------------|-------------|
| 221 Sub | 6 | 6 |
| 61 Channel | 6 | 6 |
| 113 Scour | 8 | 8 |

The following actions are recommended:

- Clean and patch the spall/voids that have exposed reinforcing steel.
- Seal cracks greater than 1/16-in wide.

The submerged portions of the substructures should be inspected at an interval not to exceed 60 months.

Sincerely,
Consor Engineers, LLC



Michael Dukes, P.E.
Project Manager



TABLE OF CONTENTS

LOCATION MAP 4

UNDERWATER INSPECTION RECORD..... 5

DESCRIPTION OF CONDITIONS 6

SUBSTRUCTURE CONDITIONS 7

INSPECTION PHOTOS 9

DRAWINGS & CONTOURSAppendix 1

LOCATION MAP



Coordinates: 35.519054°N, 95.126413°W

UNDERWATER INSPECTION RECORD

BACKGROUND AND DESCRIPTION OF STRUCTURE

The location of the bridge is shown on the Location Map on Page 4. Bridge No. 5159-0300-X (NBI 17611) carries SH 100 over the Arkansas River at the county line of Sequoyah County and Muskogee County. The bridge was constructed in 1969. It is 1928.1-ft long and 35.3-ft wide.

The bridge is a 15-span structure with 12 multi-beam approach spans and three continuous steel two-girder main spans with a reinforced concrete deck supported by two abutments and 14 intermediate piers. Piers 1 through 4 and 7 through 14 each consist of two reinforced concrete columns, joined by a webwall, and a concrete pier cap. Each column is founded on a reinforced concrete spread footing. Piers 5 and 6 each consist of a reinforced concrete pier wall founded on a reinforced concrete spread footing. Refer to Photos 1 through 5 for overall views of the bridge and typical substructure configurations.

AUTHORIZATION AND SCOPE

This underwater inspection was authorized by Engineering Contract No. CI-2348, Job Piece No. 35968(04). The scope includes an in-depth underwater bridge inspection from the channel bottom to the water surface. Each inspection includes documentation of existing conditions and soundings adjacent to each substructure. This report presents the findings of the underwater inspection.

INSPECTION PROCEDURES

A four-man inspection team, comprised of a registered professional engineer diver and three technician divers, performed the inspection. Diving was conducted in accordance with OSHA Subpart T. All diving operations were performed using commercial SCUBA. A complete visual/tactile inspection was conducted on all accessible portions of the substructure units below water. Additional cleaning of the substructure surfaces was performed as required to determine the extent of any observed deficiencies.

CRITICAL DEFICIENCIES

No critical deficiencies were observed during the underwater inspection.

DETAILED DESCRIPTION OF CONDITIONS

This section presents a narrative of findings for each individual pier and a discussion of bridge scour conditions. The data provided in this section is graphically represented in Appendix A.

Site Conditions

- Weather: Clear
- Air Temperature: 43° F
- Water Temperature: 69° F
- Water Velocity: 0.5 FPS
- Water Visibility: 1.0-ft
- Max Dive Depth: 20-ft
- Dive Method: Commercial SCUBA
- Access: Boat launched from boat ramp at the northeast corner of the bridge.

The waterline at the time of the inspection was 459.7 based on the Tulsa District US Army Corp of Engineers, Real-time Gage Data for Reservoirs and Stream Gages.

Channel Conditions (NBI Item 61)

The channel in the vicinity of the bridge has a slight bend and is well aligned with the piers. There are spur dikes on the east bank (outside of the bend), approximately 450-ft, 1400-ft, and 2700-ft upstream of the bridge. Refer to Photo 10. Both embankments are protected with dense vegetation. The embankments appear stable. There is light to moderate timber debris on the channel bottom at Piers 3, 4, 7, 8, 9, and 10; however, there are no significant restrictions to flow at the bridge. The channel bottom material at the piers consists of sand, gravel, and rock. Refer to Photos 4 through 10 for views of the channel alignment and embankments.

Scour (NBI Item 113)

There has been general scour ranging from 5-ft to 15-ft, west of Pier 8 since construction. The top of the footing at Piers 4, 5, 6, 8 and 9 are exposed; however, the footings are shown to be keyed into hard shale on the available plans and scour of the channel bottom material is not anticipated. Hands-on inspection of the exposed footings are consistent with the footings being keyed into shale. Footing exposure is as follows:

Pier 4: The top of each footing is exposed. There is no vertical exposure.

Pier 5: The top of the footing is exposed with intermittent vertical exposure up to 4-in high along the west face.

Pier 6: The top of the footing is exposed but is 1-in to 6-in below the surrounding channel bottom.

Pier 8: The top of the footing is exposed but is up to 12-in below the surrounding channel bottom.

Pier 9: The top surface of Footing 1 is exposed at the downstream end only. The entire top surface of Footing 2 is exposed.

SUBSTRUCTURE CONDITIONS (ODOT Item 221)

Substructure Type: Concrete

Pier Type and Foundation: RC Columns or Pier Walls on Spread Footings

Total # of SSUs: 16

Numbered from: West to East

No. of SSUs in the Water: 12

Range of SSUs Inspected: Piers 2 through 13

Inspection Notes

General notes: The submerged portions of the substructure are in satisfactory condition. There is light abrasion on the columns and webwalls ranging from 1/16-in deep to 1/8-in deep and algae growth. Refer to Photos 11 and 12.

Pier 2:

- Webwall, exposed reinforcing due to insufficient cover. Refer to Photo 13.

Pier 3:

- Column 1, east quadrant at the waterline, area of voiding 12-in H x 3-in W x 2-in D.
- Column 1, east quadrant at the waterline, spall 3-in H x 3-in W x 1-in D.
- Column 1, south quadrant above the step out, void 4-in H x 4-in W x 3/4-in D.
- Webwall, west face above the waterline, shallow spalls. Refer to Photo 14.

Pier 4:

- Webwall, voiding up to 2-in deep on the bottom surface.
- Webwall, exposed reinforcing due to insufficient cover. Refer to Photo 15.

Pier 5:

- Column, northeast quadrant next to the lower step out, spall 3 1/2-in H x 9-in W x 2-in D.
- Footing, areas of abrasion on the top surface up to 1/4-in deep.

Pier 6:

- Column, intermittent voiding up to 5-in H x 1-in D at random locations.
- Footing, the top surface is irregular.
- Column/Footing interface, voiding at the downstream nose up to 3-in H x 1/2-in D. Refer to Photo 16.
- Caisson dolphin, impact damage to the northwest quadrant. Refer to Photos 17 through 19.

Pier 7:

- Column 2, north quadrant, 2-ft above the waterline, area of spalling up to 48-in wide x up to 2 1/2-in deep with associated map cracking up to 1/32-in wide with efflorescence. Refer to Photos 20 and 21.
- Webwall, west face, exposed reinforcing due to insufficient cover

Pier 8:

- Webwall, above the waterline, shallow spalls with exposed reinforcing.
- Column 2, west quadrant, extending up from the lower step out, spall 24-in H x 18-in W x 1-in D.
- Both columns, all quadrants above the waterline, hairline vertical cracks with efflorescence.
- Column 2, upstream nose, 15-in below the lower step out, spall 6-ft H x 6-ft W x 1 1/2-in D.

Pier 11:

- Webwall, shallow spalls with exposed steel at random locations.
- Column 1, southwest quadrant, from the waterline to the channel bottom, vertical crack up to 1/16-in wide.
- Both columns, at the southwest quadrant, from the waterline to the channel bottom, hairline to 1/16-in wide vertical cracks with efflorescence. Refer to Photo 22.

Pier 12:

- Webwall, areas of delamination at random locations near the high waterline.
- Column 2, east quadrant, 7-ft below the step out, spall 4-in H x 2-in W x 1/2-in D.

Pier 13:

- Both columns, vertical cracks hairline to 1/16-in wide with efflorescence.
- Column 1, southwest quadrant, starting 2-ft below the waterline extending 11-ft below the waterline, vertical crack up to 3/16-in wide. Refer to Photo 23.

PREVIOUS CORRECTIVE ACTIONS

No apparent corrective actions have been performed below the waterline since the 2017 underwater inspection.

RECOMMENDATIONS

The following actions are recommended:

- Clean and patch the spall/honeycombing voids that have exposed reinforcing steel.
- Seal cracks greater than 1/16-in wide.

The submerged portions of the substructures should be inspected at an interval not to exceed 60 months.

INSPECTION PHOTOS



Photo 1 – North Elevation

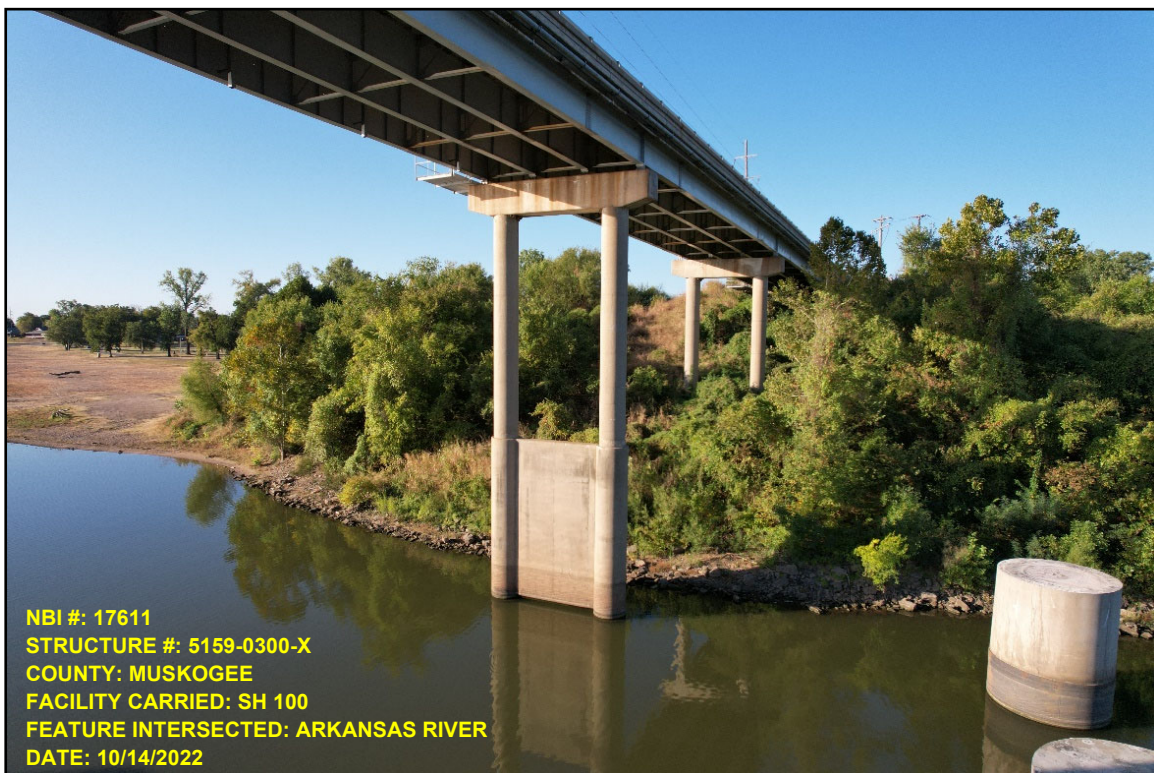


Photo 2 – Pier 2, Typical Configuration of Piers 1-4, and Piers 7-14

INSPECTION PHOTOS

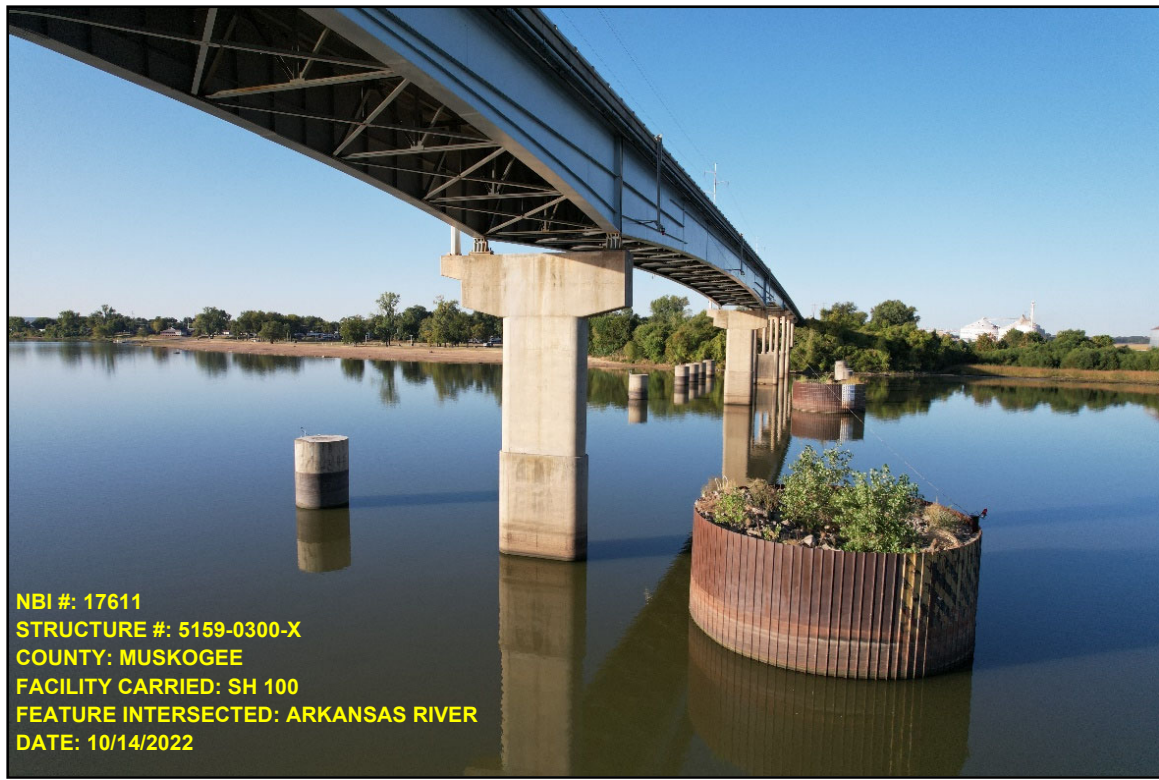


Photo 3 – Pier 5, Typical Configuration of Piers 5 and 6



Photo 4 – Plan View, West End of Structure (Flow is Right to Left)

INSPECTION PHOTOS



Photo 5 – Plan View, East Embankment (Flow is Right to Left)



Photo 6 –View Upstream (North)

INSPECTION PHOTOS



Photo 7 – View Downstream (South)

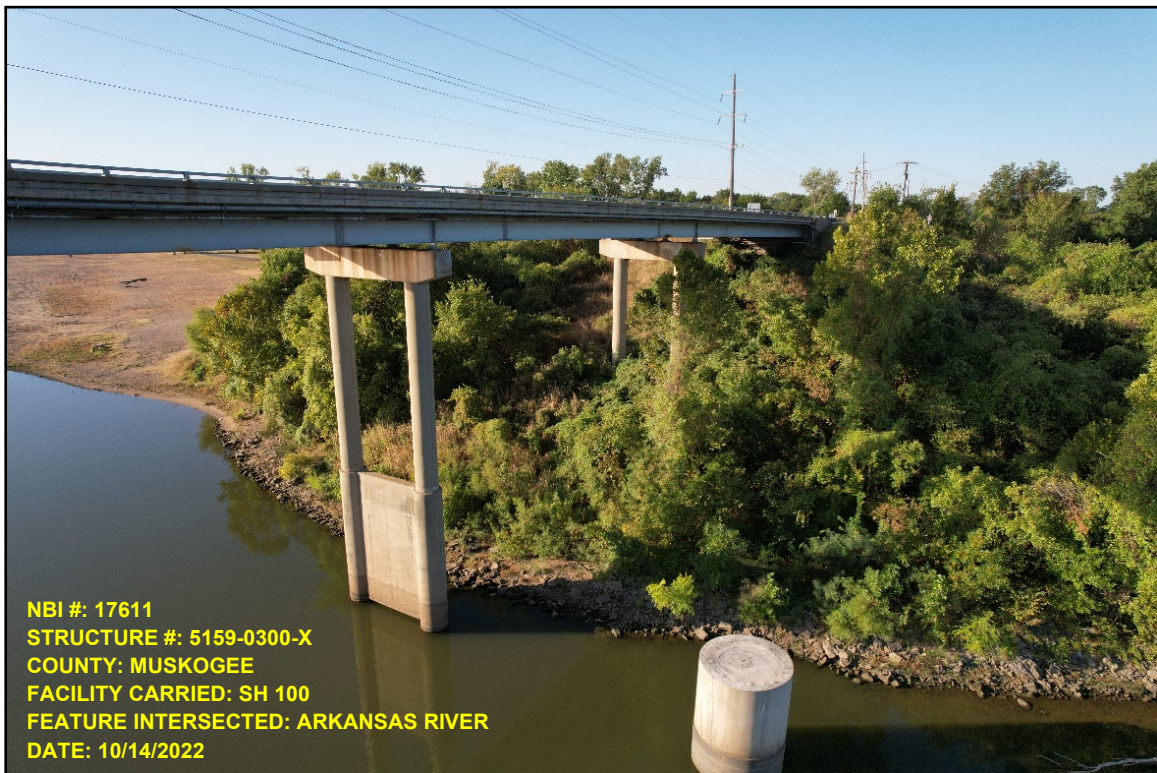


Photo 8 – West Embankment

INSPECTION PHOTOS



Photo 9 – East Embankment



Photo 10 – Spur Dikes Along East Embankment Upstream of Bridge

INSPECTION PHOTOS



Photo 11 – Typical Concrete Condition Above the Waterline (Abrasion)



Photo 12 – Typical Concrete Condition Above the Waterline (Abrasion)

INSPECTION PHOTOS



Photo 13 – Pier 2, Webwall, Exposed Reinforcing

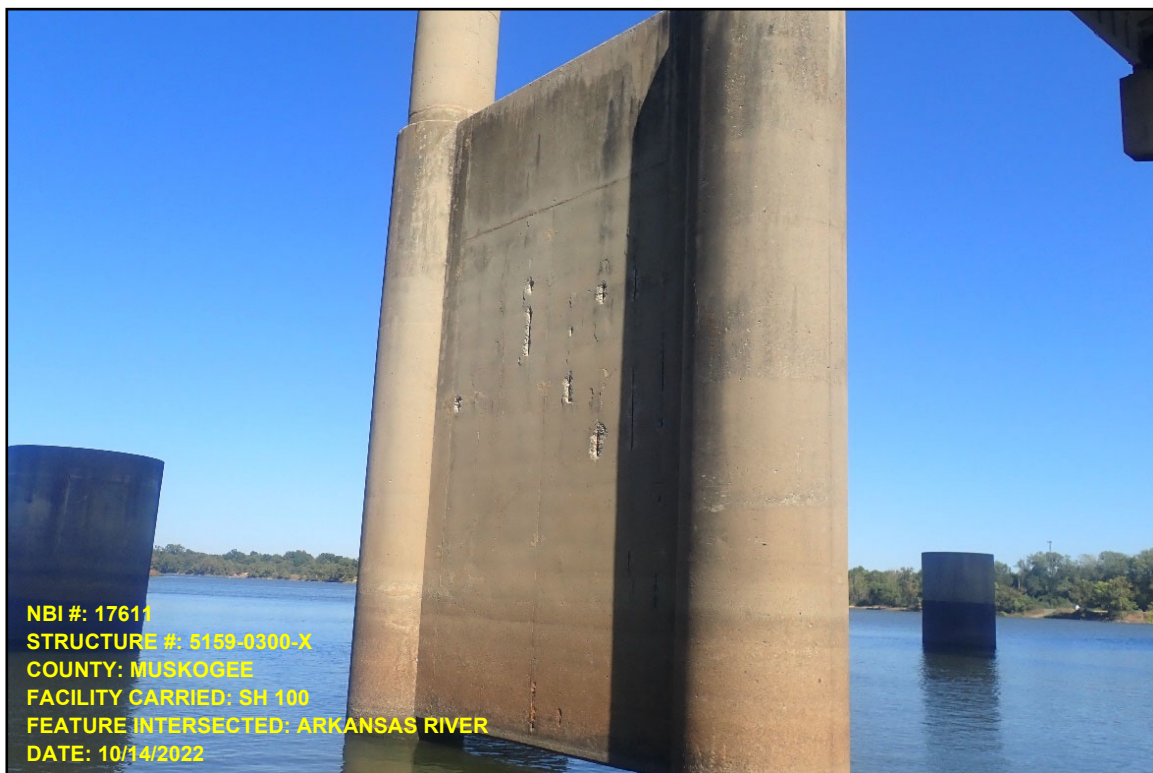


Photo 14 – Pier 3, Webwall, Spalls w/Exposed Steel

INSPECTION PHOTOS

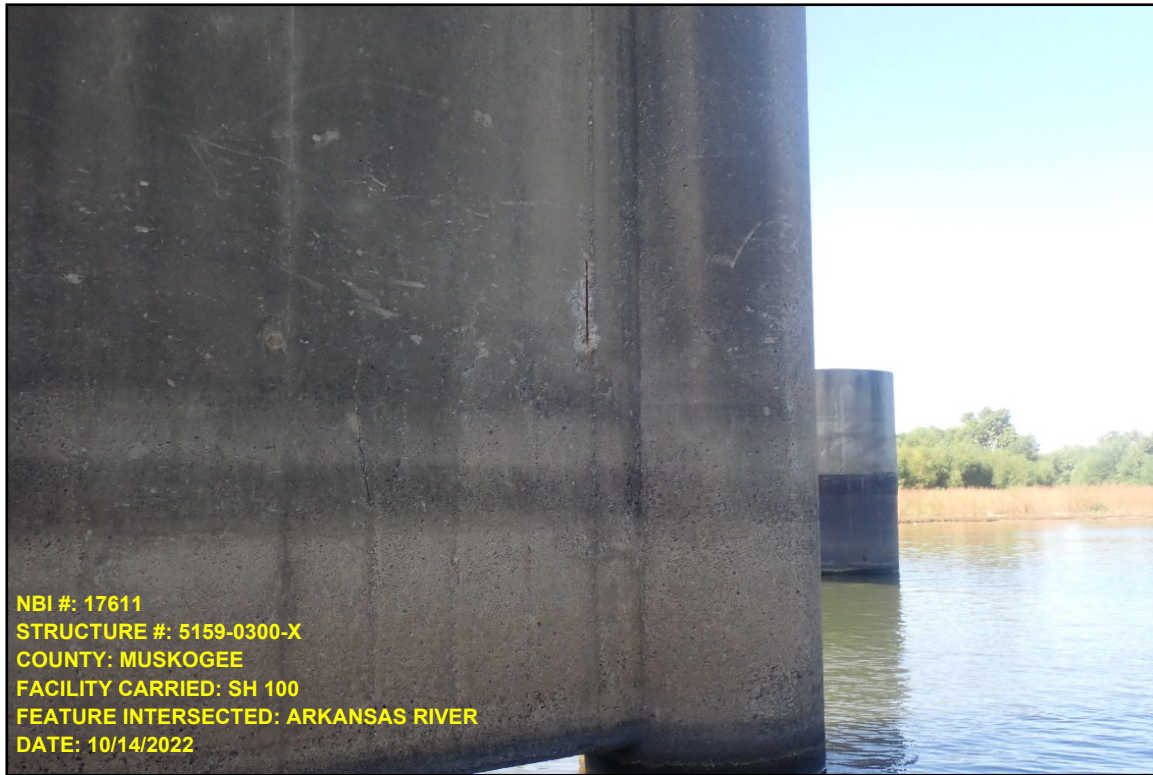


Photo 15 – Pier 4, Webwall, Spall with Exposed Reinforcing



Photo 16 – Pier 6, Footing/Column Interface, Voiding 3-in H x 1/2-D

INSPECTION PHOTOS

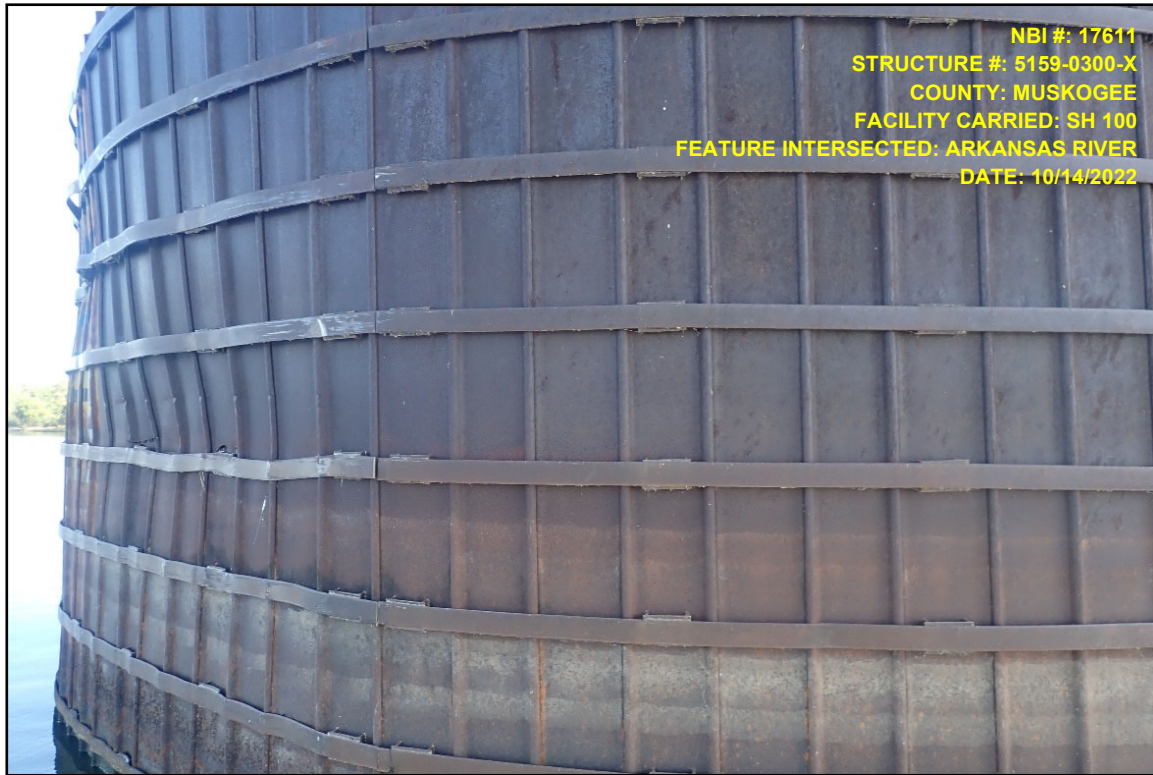


Photo 17 – Pier 6 Dolphin, Impact Damage



Photo 18 – Pier 6 Dolphin, Impact Damage

INSPECTION PHOTOS



Photo 19 – Pier 6 Dolphin, Impact Damage



Photo 20 – Pier 7, Column 2, Spall 48-in W x 2 1/2-in D

INSPECTION PHOTOS



Photo 21 – Pier 7, Column 2, Map Cracking with Efflorescence

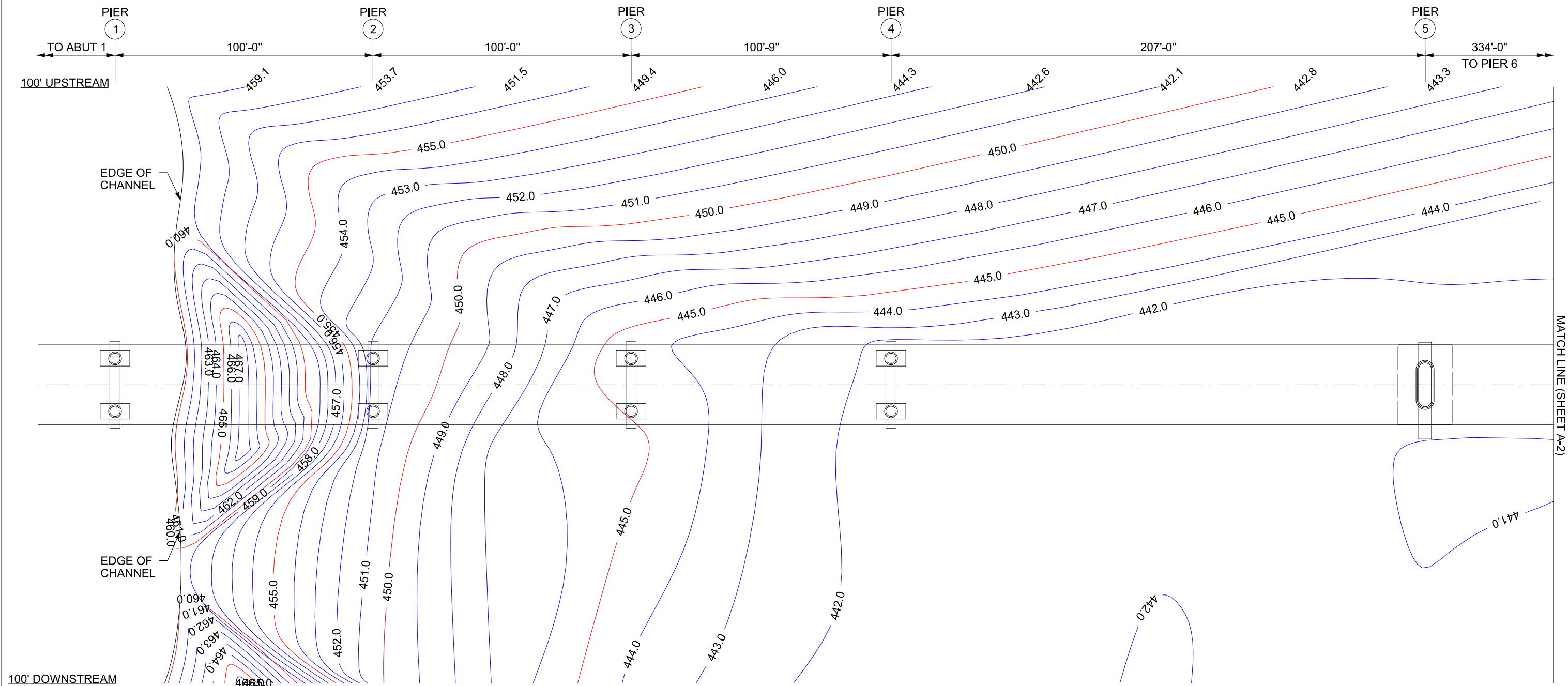


Photo 22 – Pier 11, Both Columns, Typical Cracks up to 1/16-in Wide with Efflorescence

INSPECTION PHOTOS



Photo 23 – Pier 12, Column 1, Vertical Crack up to 3/16-in Wide
Below the Waterline

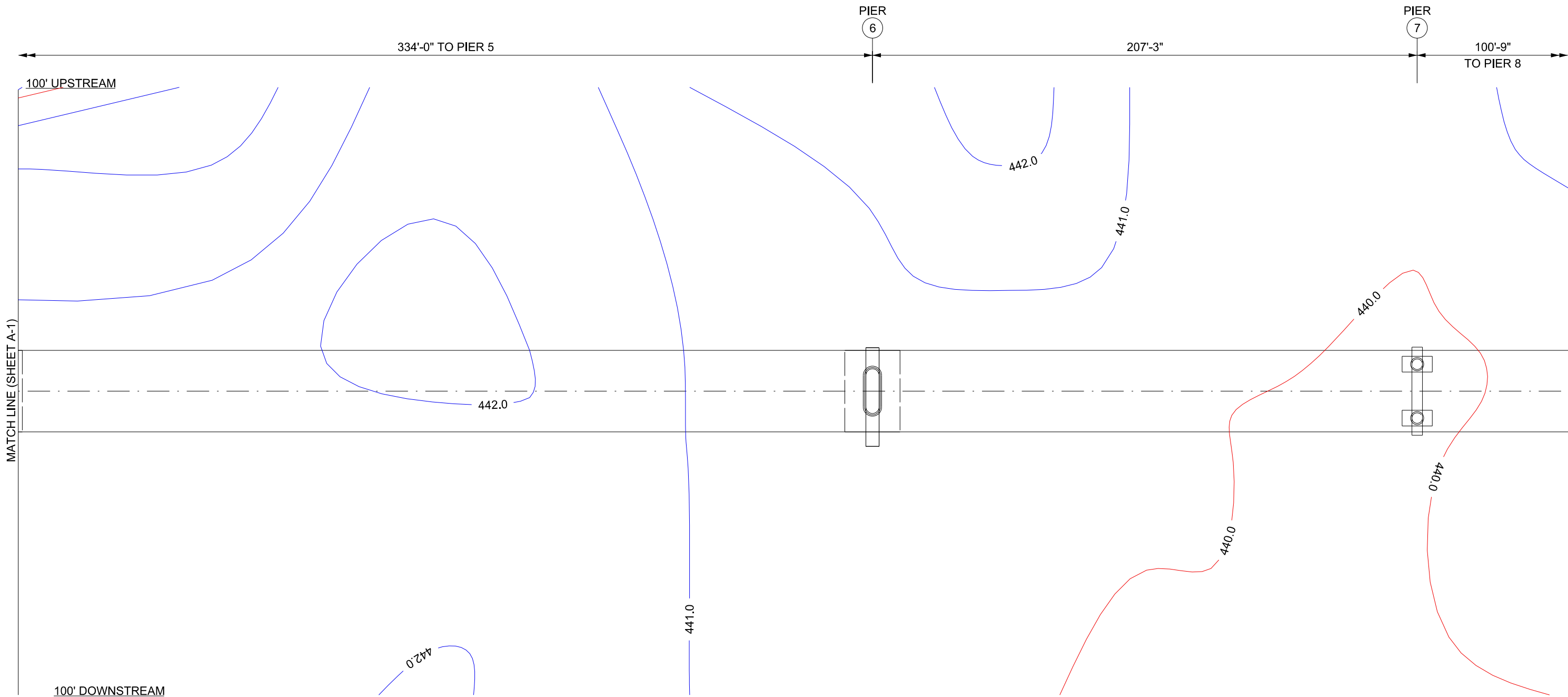


CONTOURS

GENERAL NOTES:

1. THE WATER ELEVATION AT THE TIME OF INSPECTION ON OCTOBER 14, 2022 WAS 459.7, BASED ON THE TULSA DISTRICT U.S. ARMY CORPS OF ENGINEERS REAL-TIME GAGE DATA FOR RESERVOIRS AND STREAM GAGES.

| | | | | |
|---|------------------|---|--|-------------|
| GRAPHIC SCALE MEASURED IN FEET 0 40 80 1" = 40' | DATE OCT 2022 |  <div>609 S. Kelly Avenue Suite J-1 Edmond, OK 73003 PH.: 405.285.2560</div> | SH 100 OVER ARKANSAS RIVER BRIDGE NO. 17611 | |
| | | | CONTOURS (PAGE 1 OF 3) | PAGE A-1 |

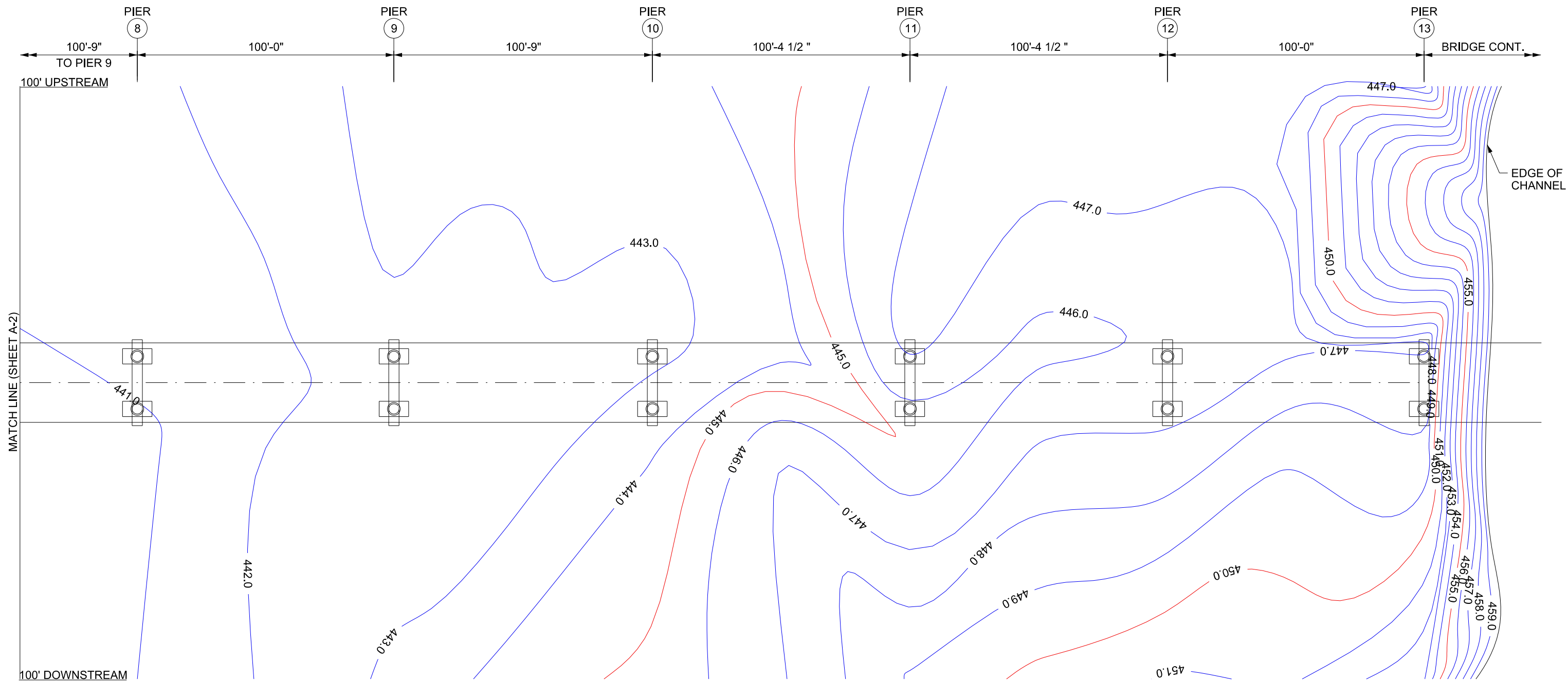


CONTOURS

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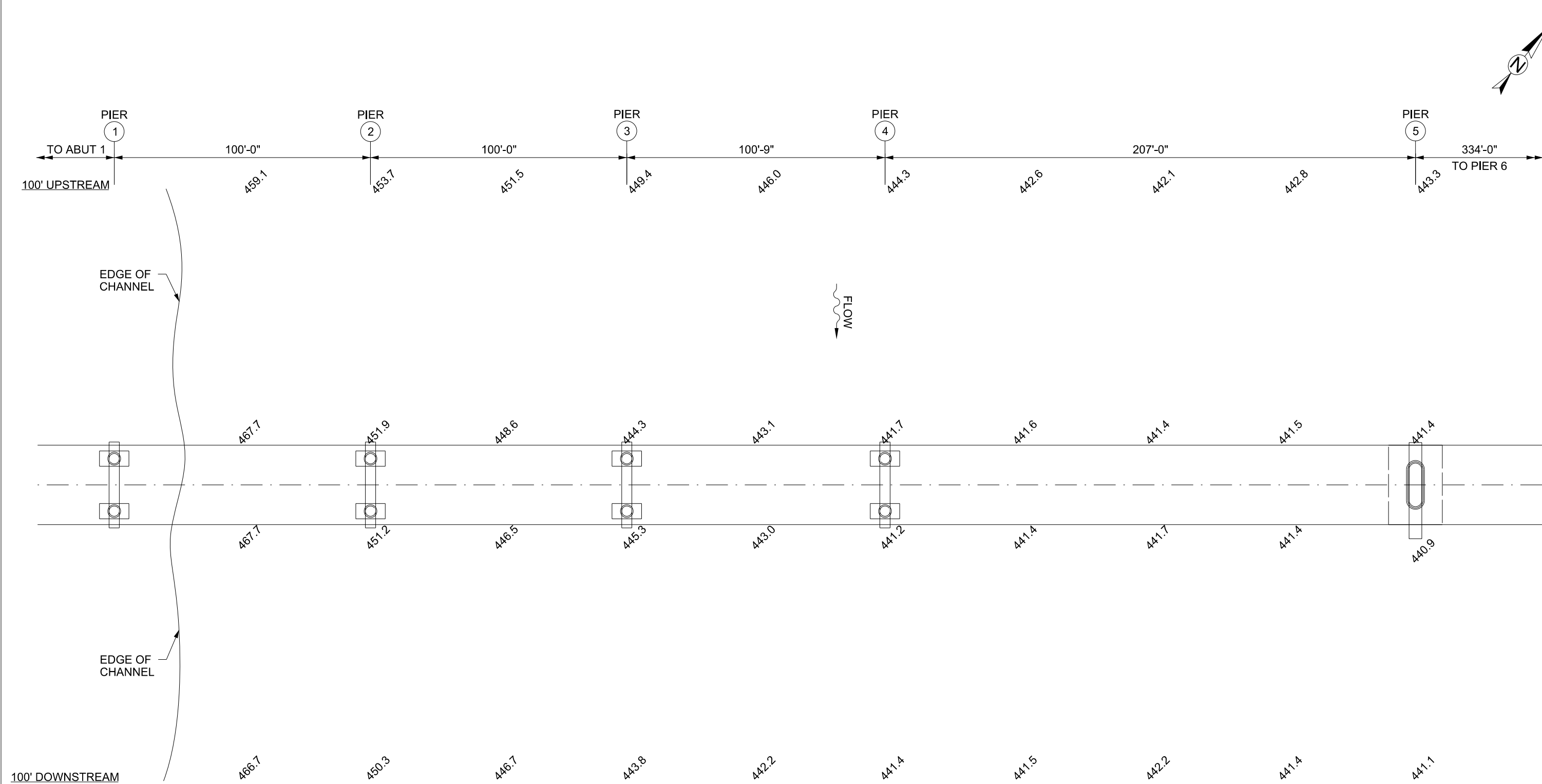
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| | | | CONTOURS (PAGE 2 OF 3) | PAGE A-2 |



CONTOURS

GENERAL NOTES:

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CHANNEL BOTTOM ELEVATIONS

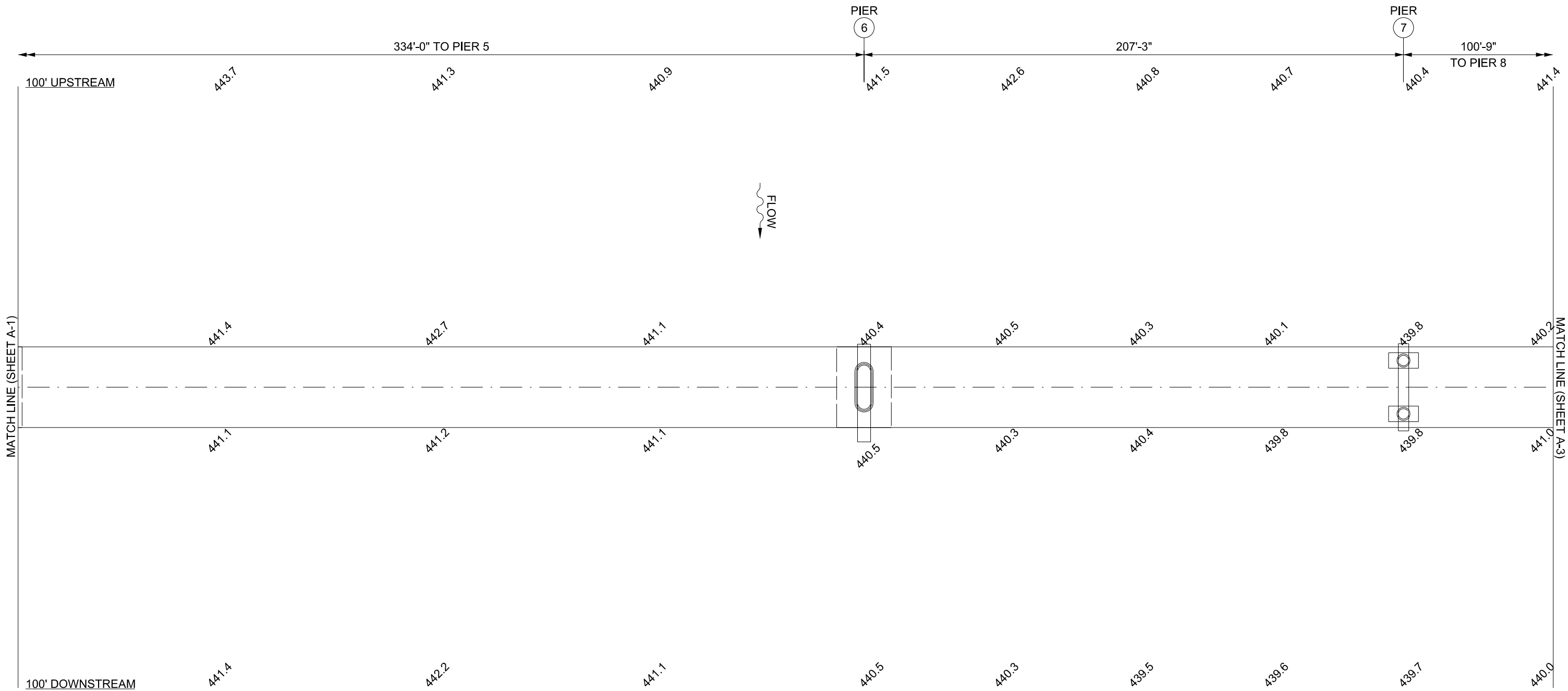
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LEGEND:

XXXX SOUNDING MEASUREMENT

| | | | | |
|---|------------------|---|--|-------------|
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| | | | SOUNDINGS (PAGE 1 OF 3) | PAGE A-4 |



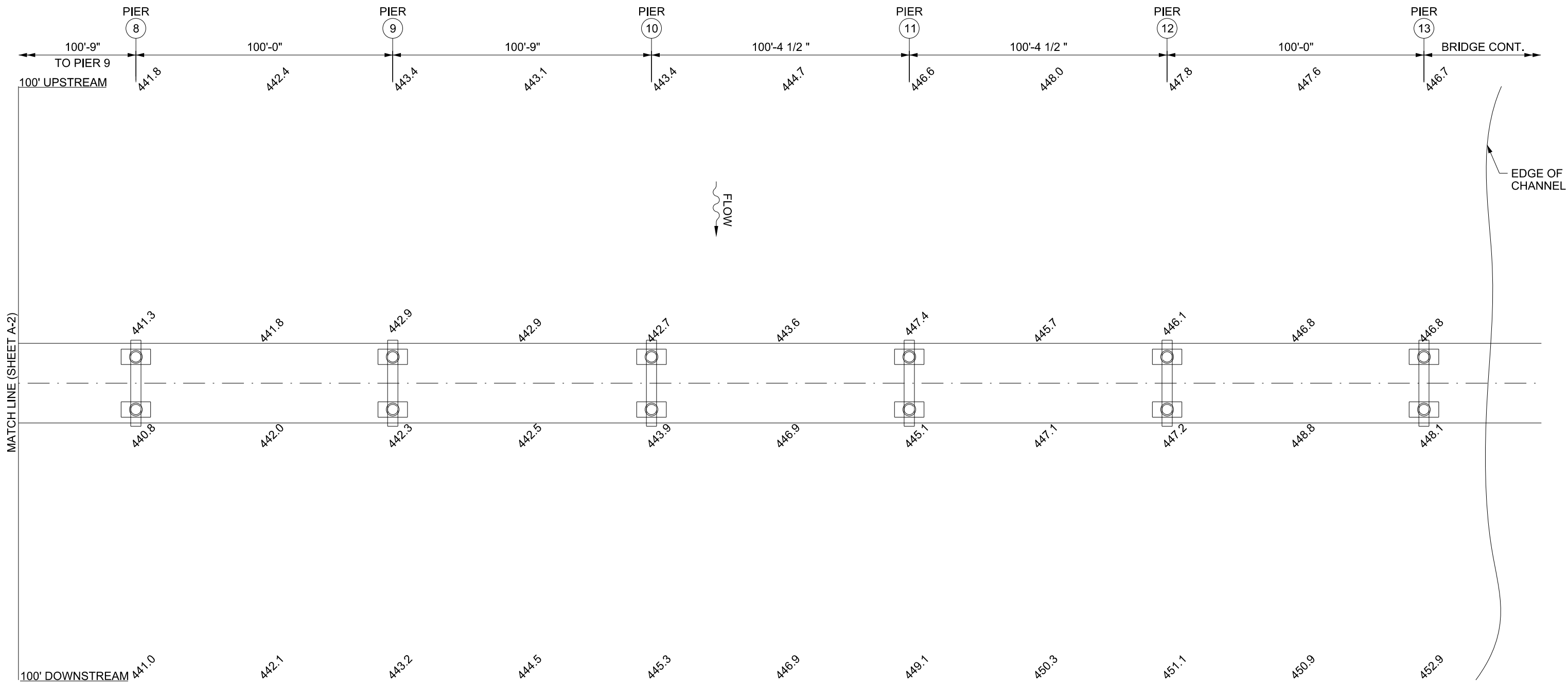
CHANNEL BOTTOM ELEVATIONS

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LEGEND:

XXXX SOUNDING MEASUREMENT



CHANNEL BOTTOM ELEVATIONS

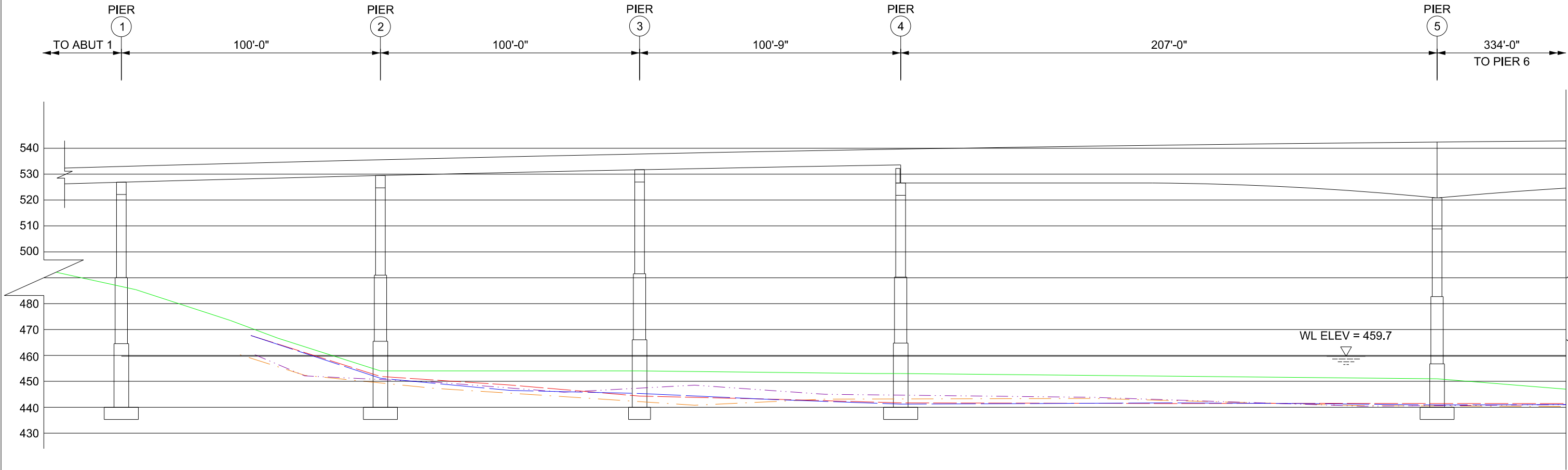
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LEGEND:

XXXX SOUNDING MEASUREMENT

| | | | | |
|---|----------------------|--|--|-------------|
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| | | | SOUNDINGS (PAGE 3 OF 3) | PAGE A-6 |

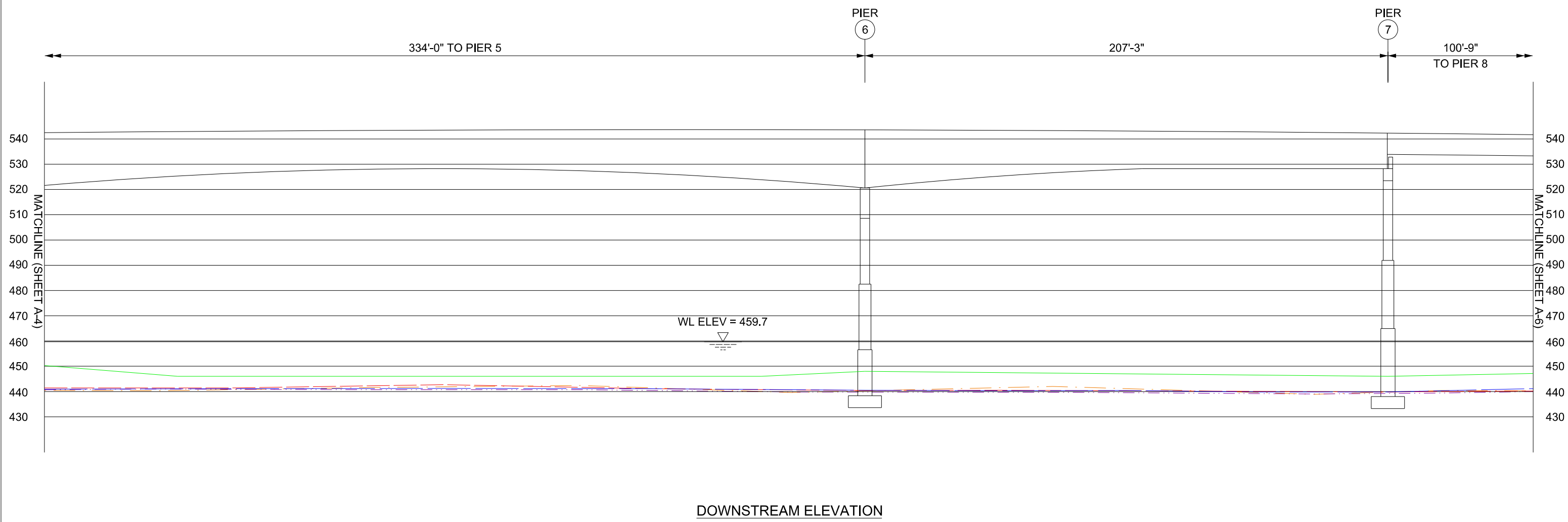


DOWNSTREAM ELEVATION

GENERAL NOTES:

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| CHANNEL PROFILE LEGEND | |
|--------------------------|---|
| ORIGINAL | — |
| 2017 - DOWNSTREAM FASCIA | - - - |
| 2017 - UPSTREAM FASCIA | - . . - . |
| 2022 - DOWNSTREAM FASCIA | — |
| 2022 - UPSTREAM FASCIA | - - - |

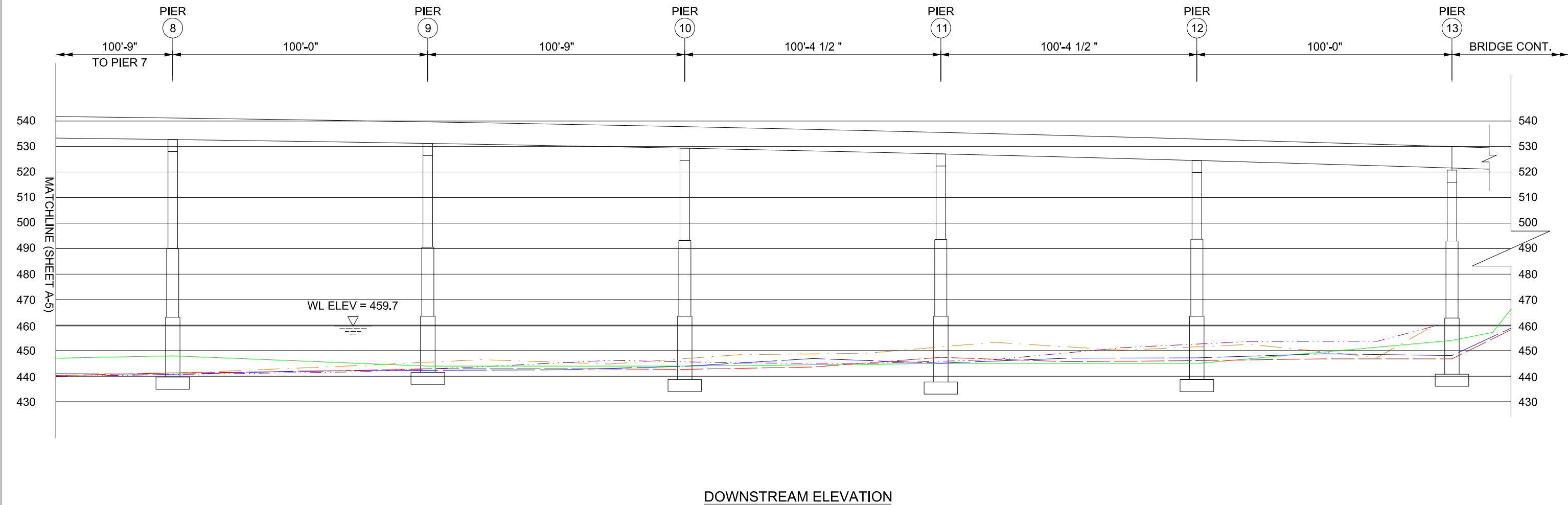


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| CHANNEL PROFILE LEGEND | |
|--------------------------|--|
| ORIGINAL | |
| 2017 - DOWNSTREAM FASCIA | |
| 2017 - UPSTREAM FASCIA | |
| 2022 - DOWNSTREAM FASCIA | |
| 2022 - UPSTREAM FASCIA | |

| | | | | |
|--|-------------------------------------|---|--|-------------|
| <div>GRAPHIC SCALE MEASURED IN FEET</div> <div><div>04080</div><div>1" = 40'</div></div> | <div>DATE</div> <div>OCT 2022</div> | <div></div> <div>609 S. Kelly Avenue Suite J-1 Edmond, OK 73003 PH.: 405.285.2560</div> | SH 100 OVER ARKANSAS RIVER BRIDGE NO. 17611 | |
| | | | CHANNEL PROFILE (PAGE 2 OF 3) | PAGE A-8 |

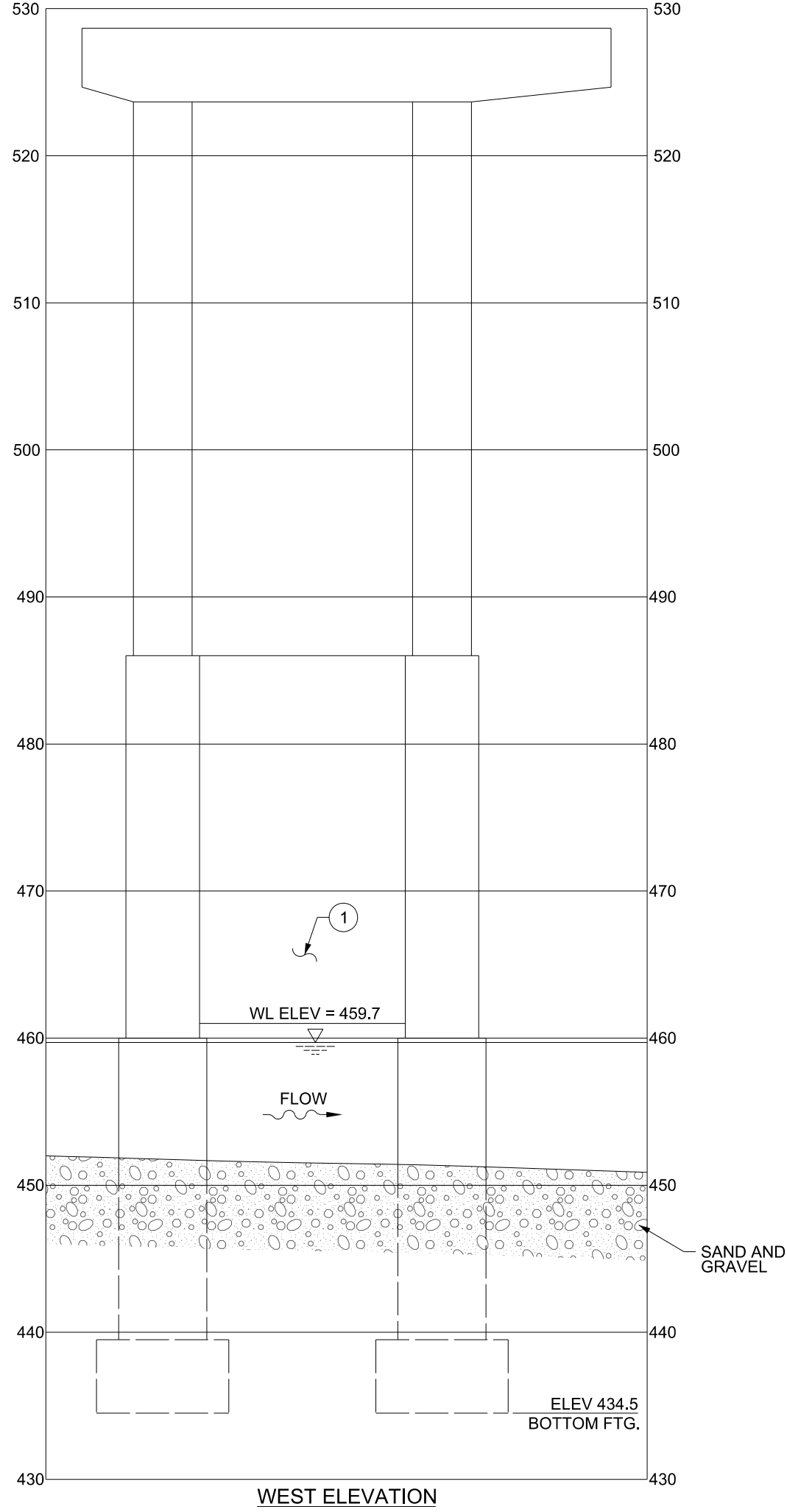


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| CHANNEL PROFILE LEGEND | |
|--------------------------|---|
| ORIGINAL | — |
| 2017 - DOWNSTREAM FASCIA | - - - |
| 2017 - UPSTREAM FASCIA | - - - |
| 2022 - DOWNSTREAM FASCIA | — |
| 2022 - UPSTREAM FASCIA | - - - |

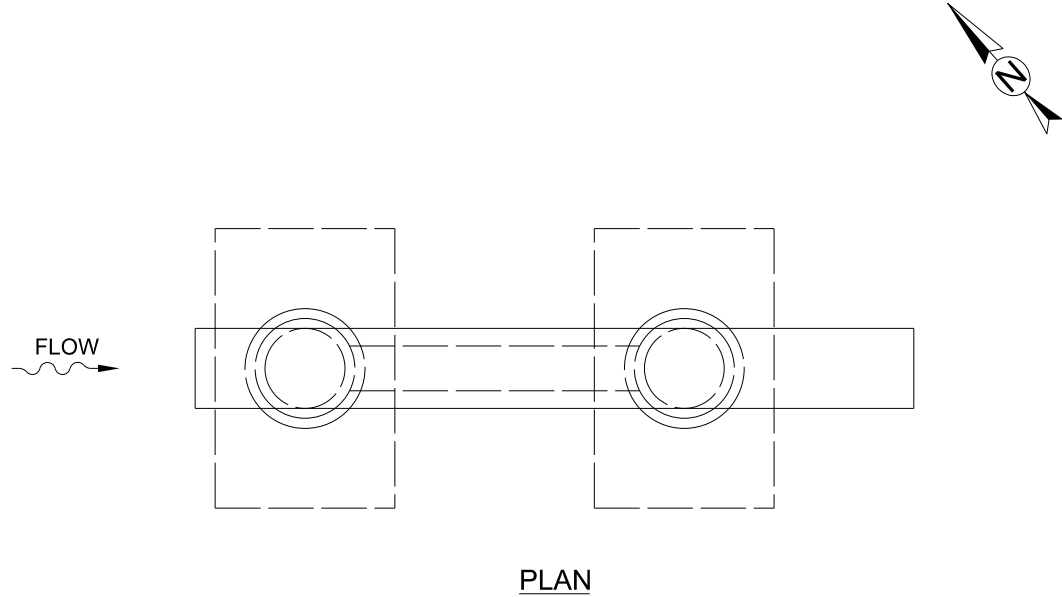
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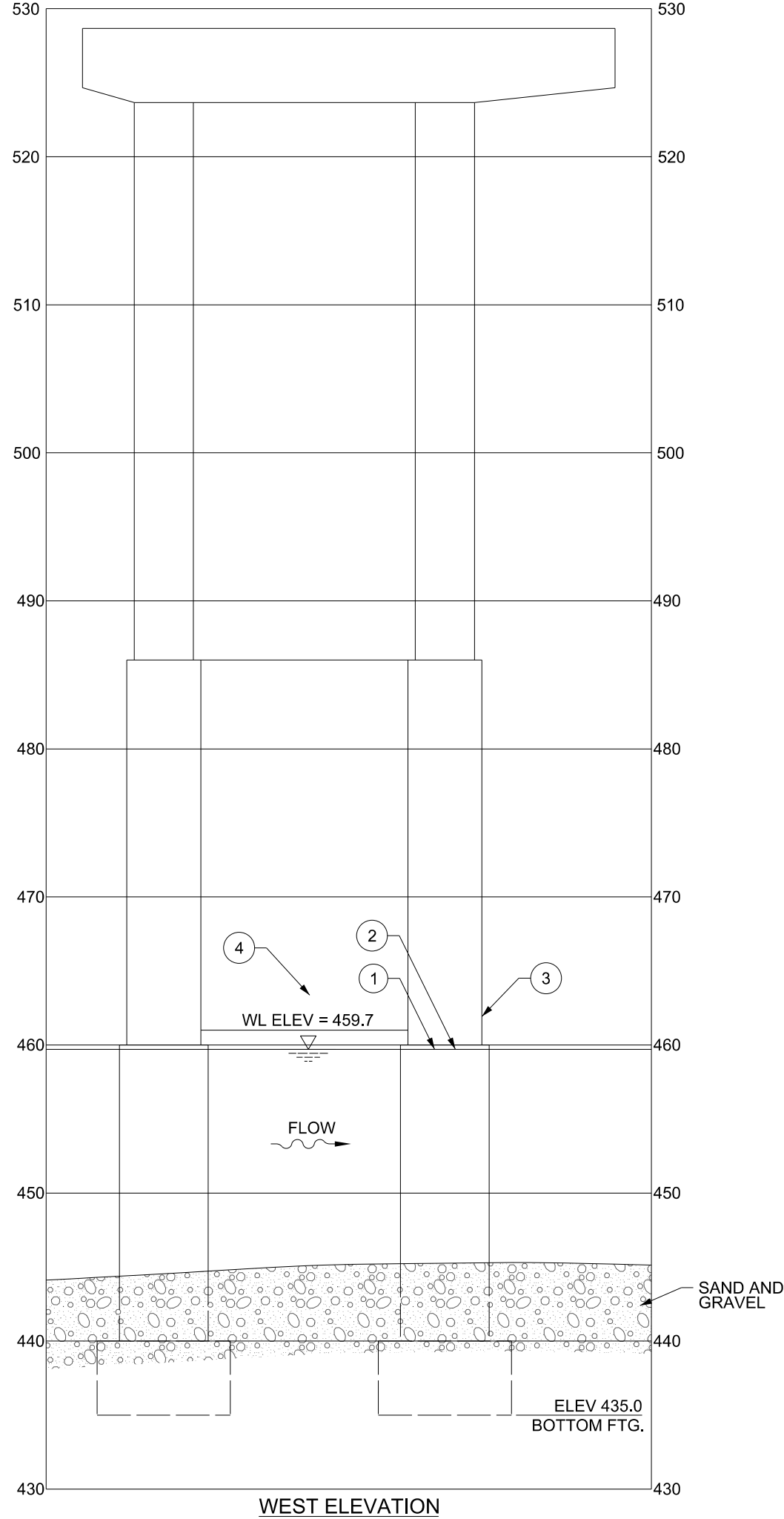


INSPECTION NOTES:

GN. LIGHT ABRASION ON THE COLUMNS AND WEBWALLS RANGING FROM 1/16-IN DEEP TO 1/8-IN DEEP AND ALGAE GROWTH.

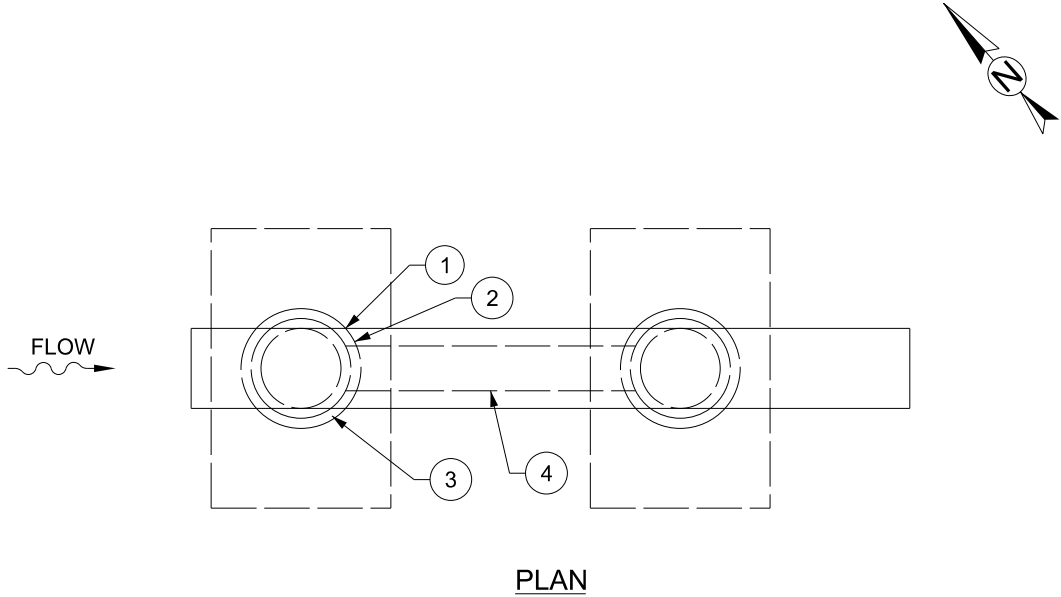
1. WEBWALL, EXPOSED REINFORCING DUE TO LACK OF COVER.

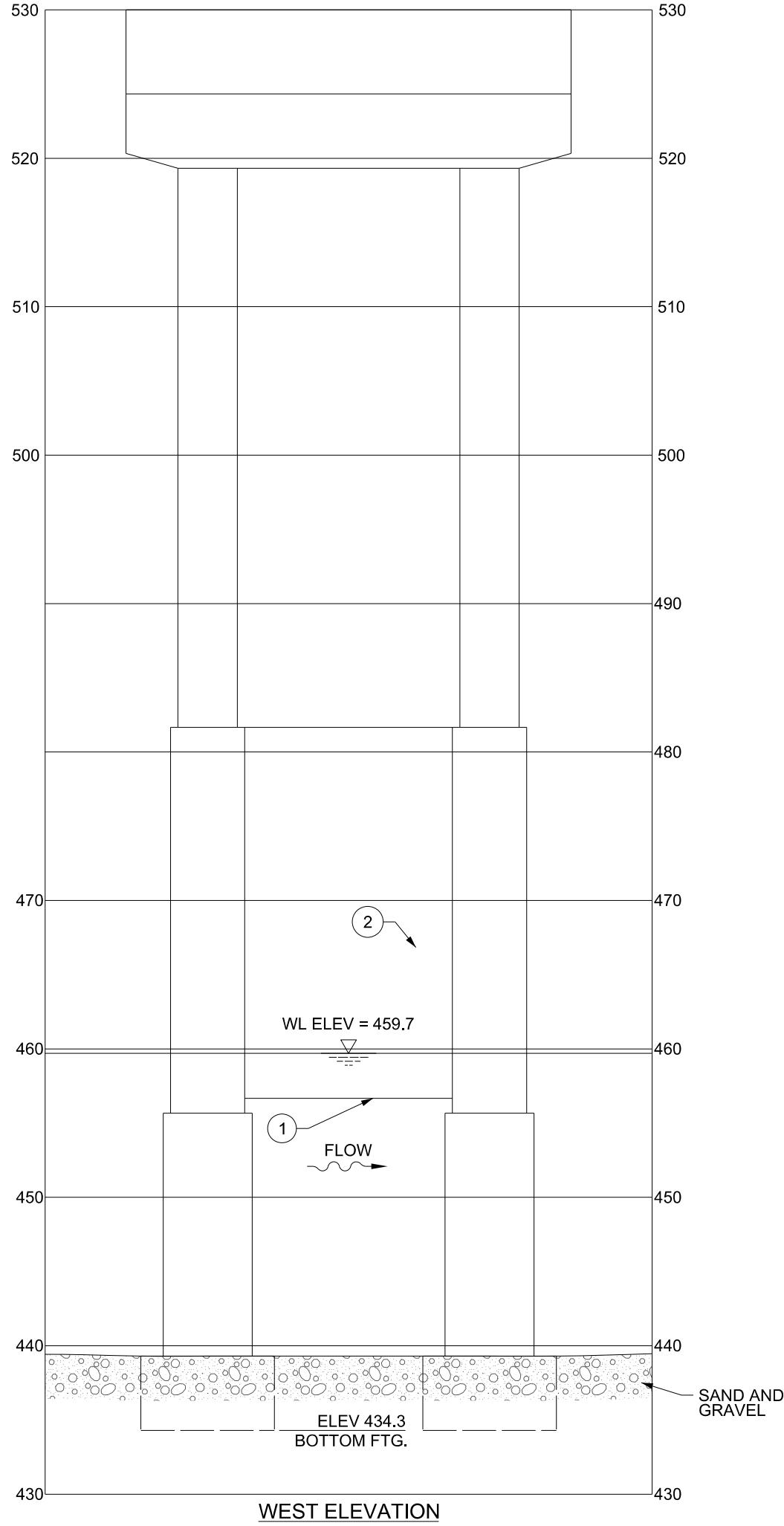




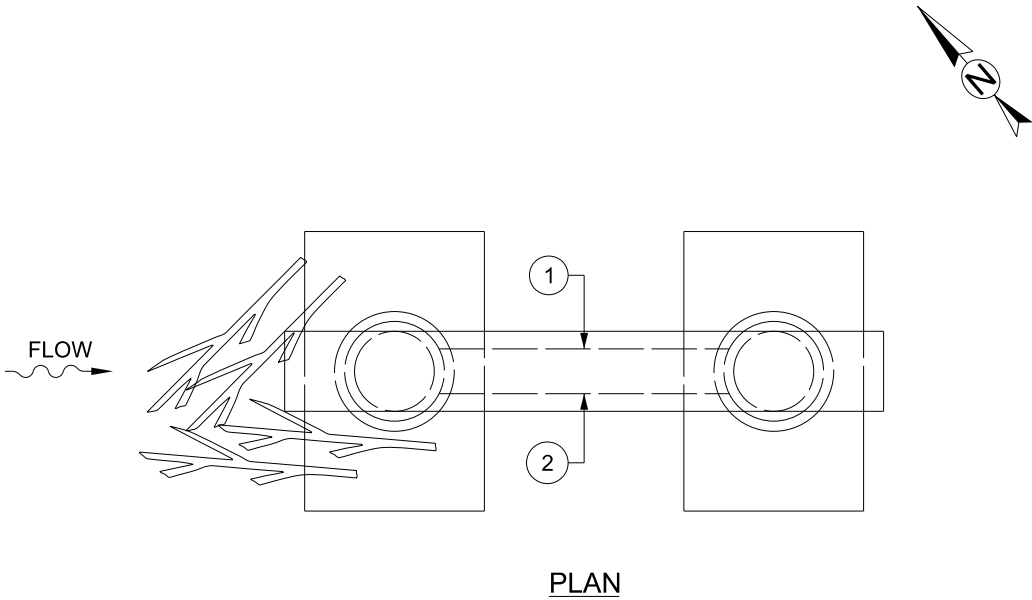
INSPECTION NOTES:

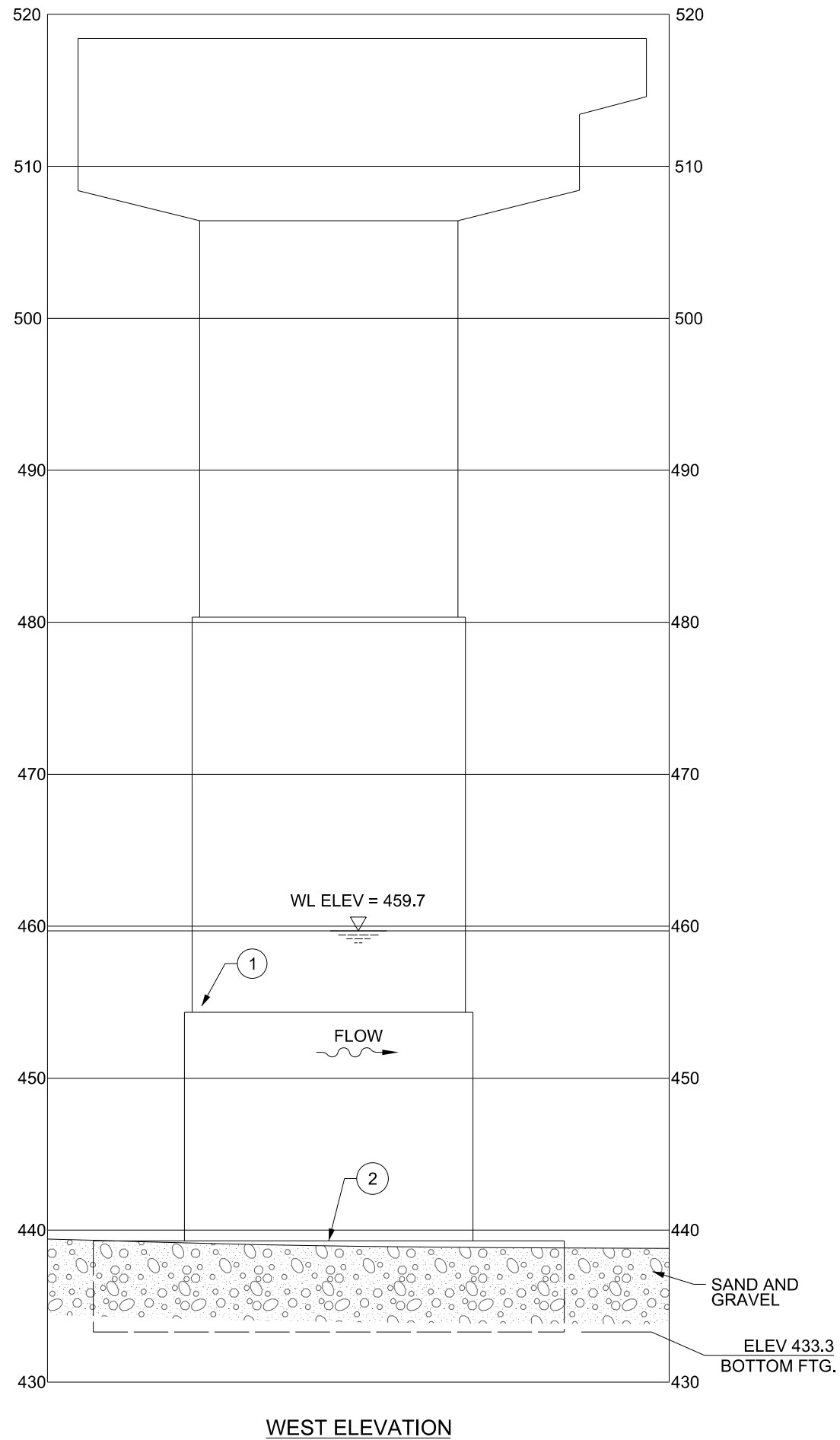
- GN. LIGHT ABRASION ON THE COLUMNS AND WEBWALLS RANGING FROM 1/16-IN DEEP TO 1/8-IN DEEP AND ALGAE GROWTH.
- COLUMN 1, EAST QUADRANT AT THE WATERLINE, AREA OF VOIDING 12-IN H X 3-IN W X 2-IN D.
 - COLUMN 1, EAST QUADRANT AT THE WATERLINE, SPALL 3-IN H X 3-IN W X 1-IN D.
 - COLUMN 1, SOUTH QUADRANT ABOVE THE STEP OUT, VOID 4-IN H X 4-IN W X 3/4-IN D.
 - WEBWALL, WEST FACE ABOVE THE WATERLINE SHALLOW SPALLS.



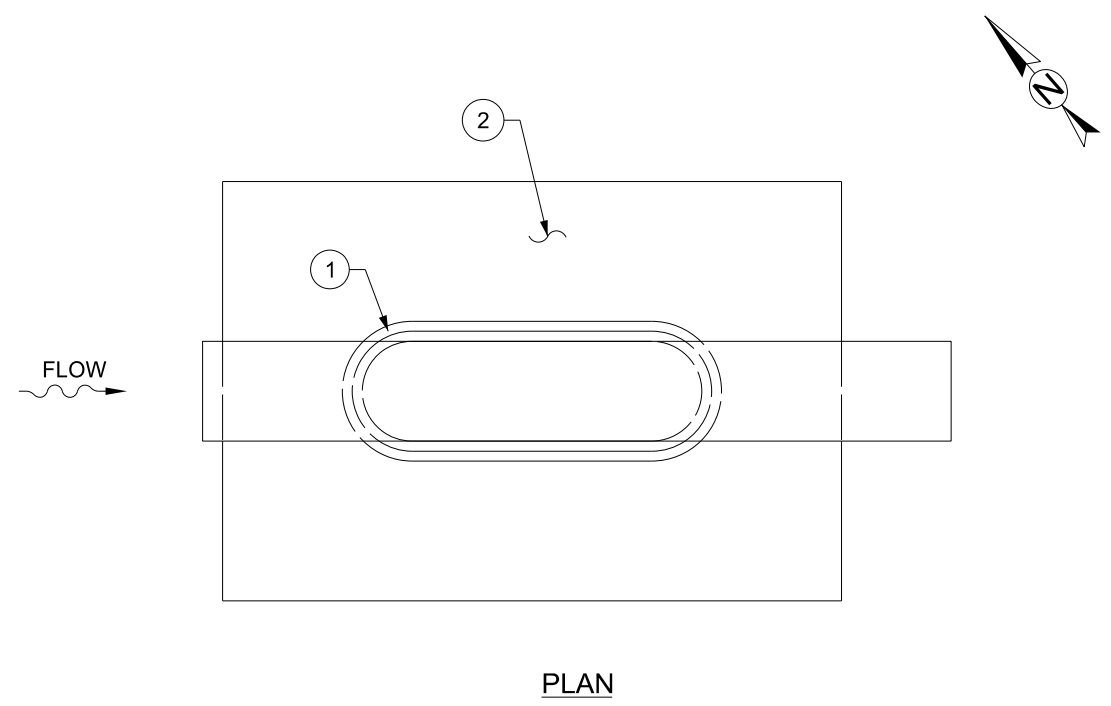


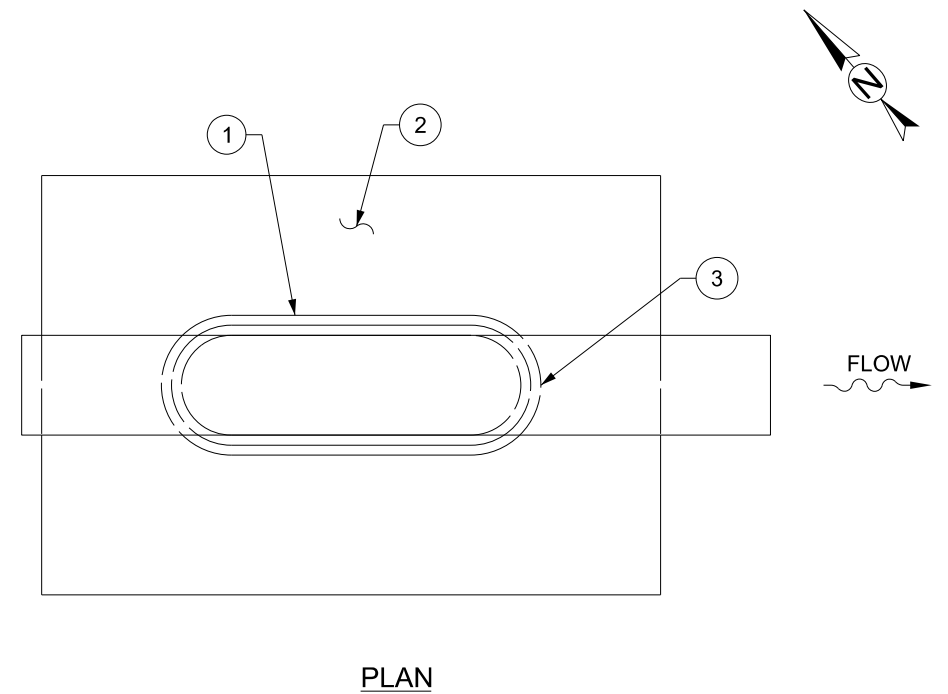
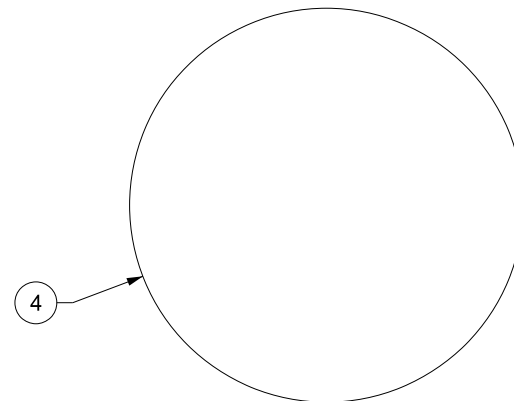
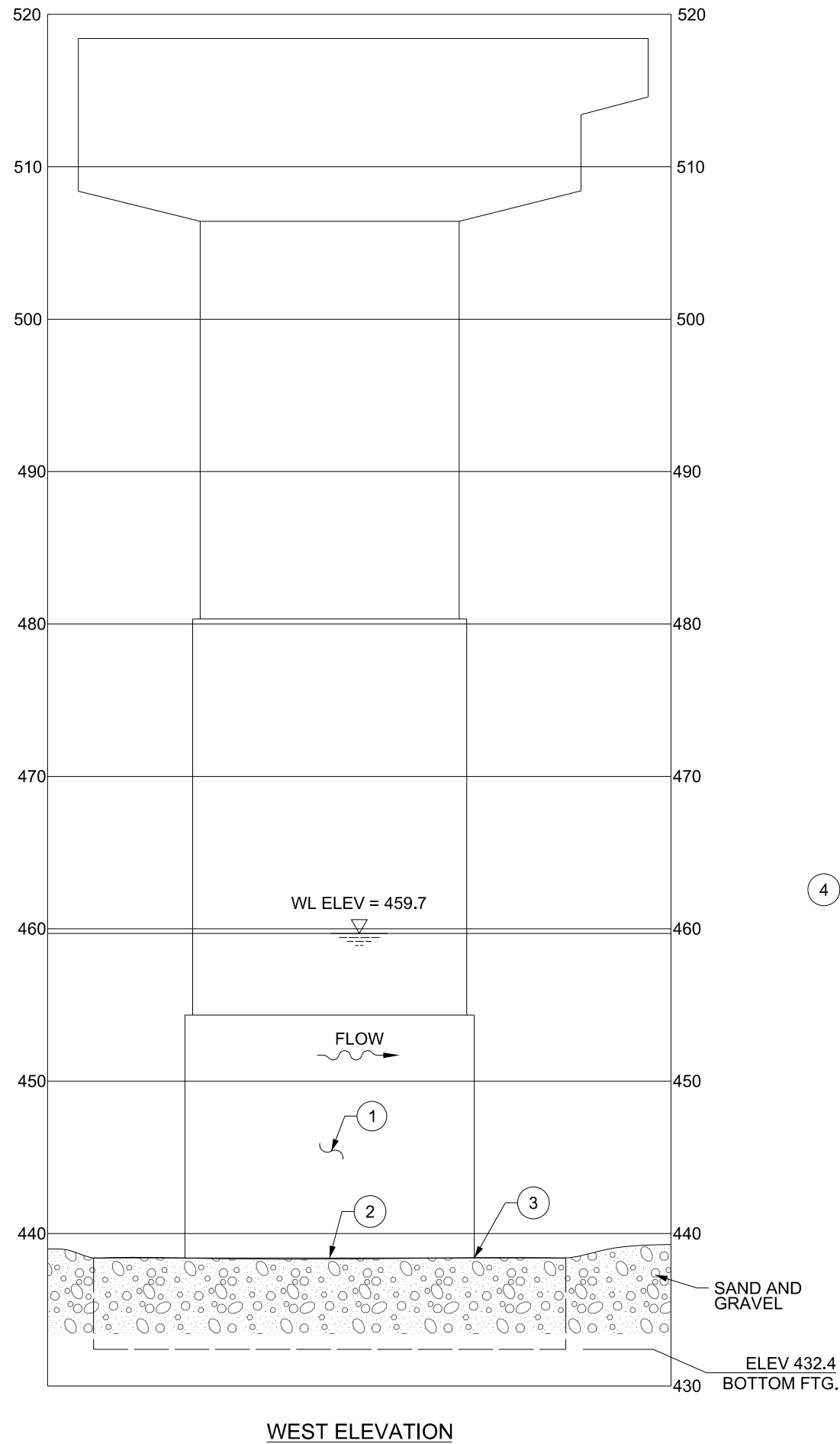
- INSPECTION NOTES:**
- GN. LIGHT ABRASION ON THE COLUMNS AND WEBWALLS RANGING FROM 1/16-IN DEEP TO 1/8-IN DEEP AND ALGAE GROWTH.
1. WEBWALL, VOIDING UP TO 2-IN D ON THE BOTTOM SURFACE.
 2. WEBWALL, EXPOSED REINFORCING DUE TO LACK OF COVER.





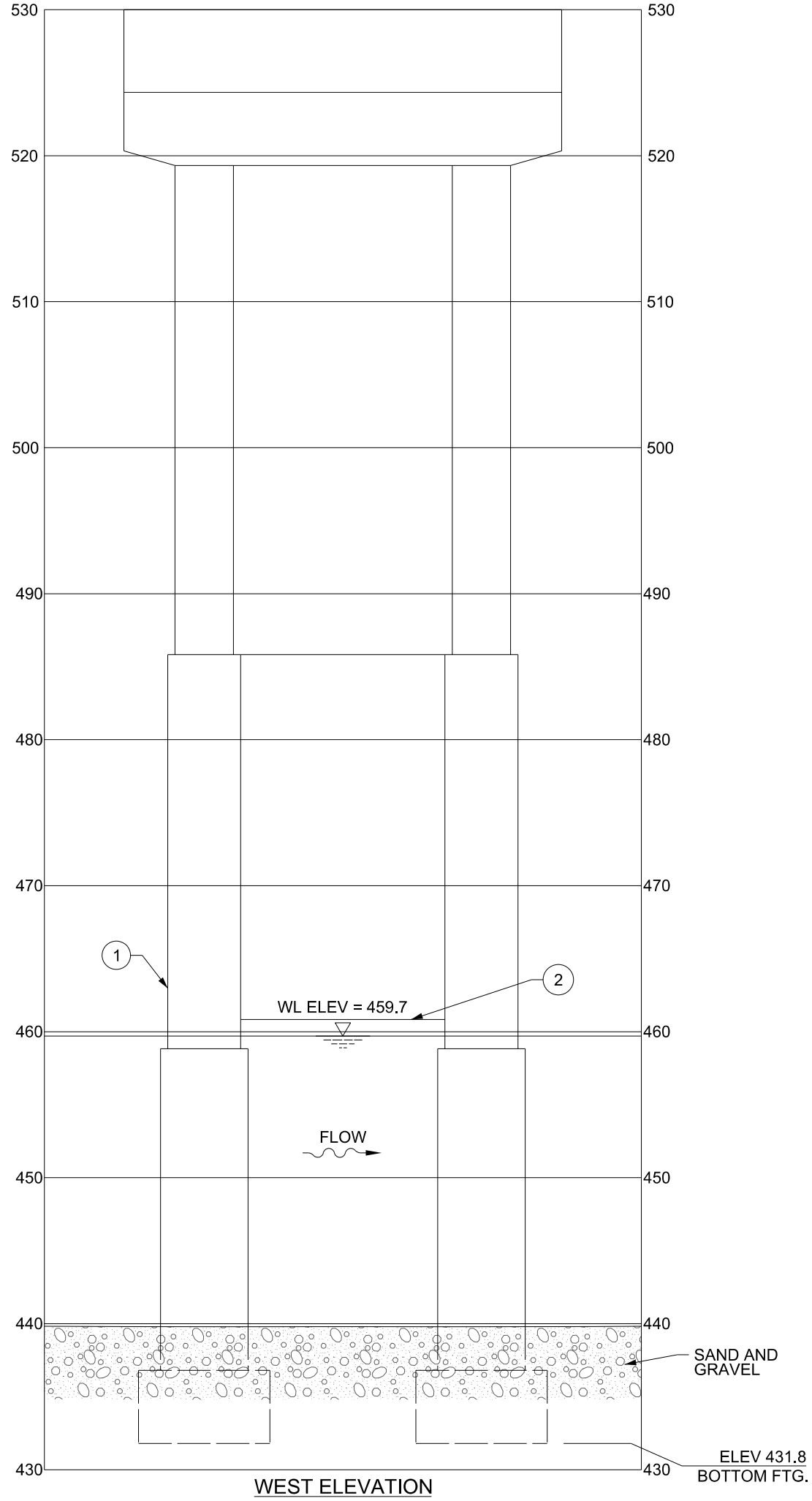
- INSPECTION NOTES:**
- GN. LIGHT ABRASION ON THE COLUMNS AND WEBWALLS RANGING FROM 1/16-IN DEEP TO 1/8-IN DEEP AND ALGAE GROWTH.
- PIER WALL, NORTHEAST QUADRANT NEXT TO THE LOWER STEP OUT, SPALL 3 1/2-IN H X 9-IN W X 2-IN D.
 - FOOTING, AREAS OF ABRASION ON THE TOP SURFACE UP TO 1/4-IN D.





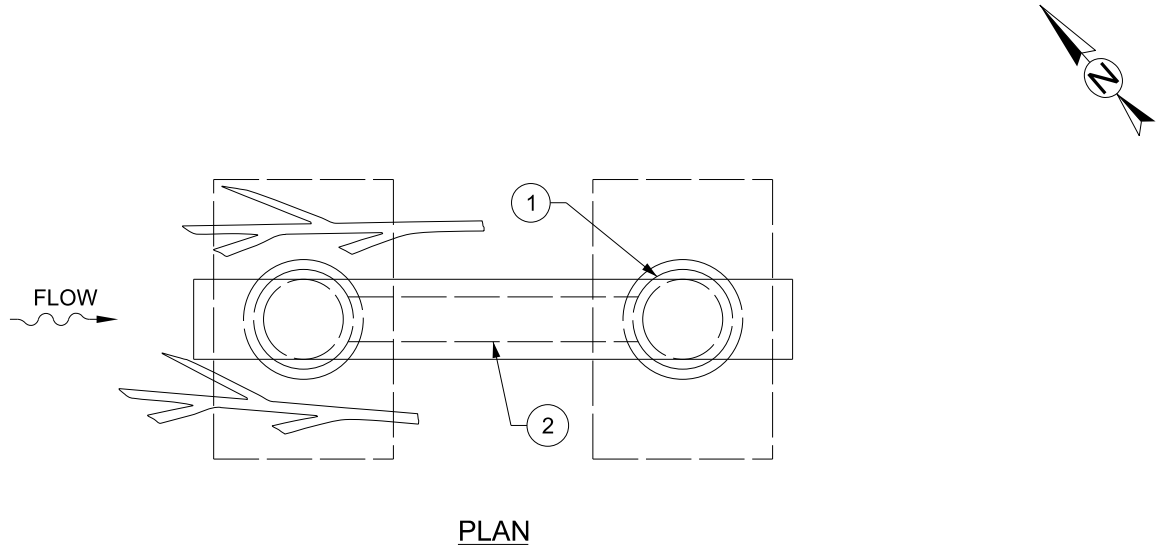
INSPECTION NOTES:

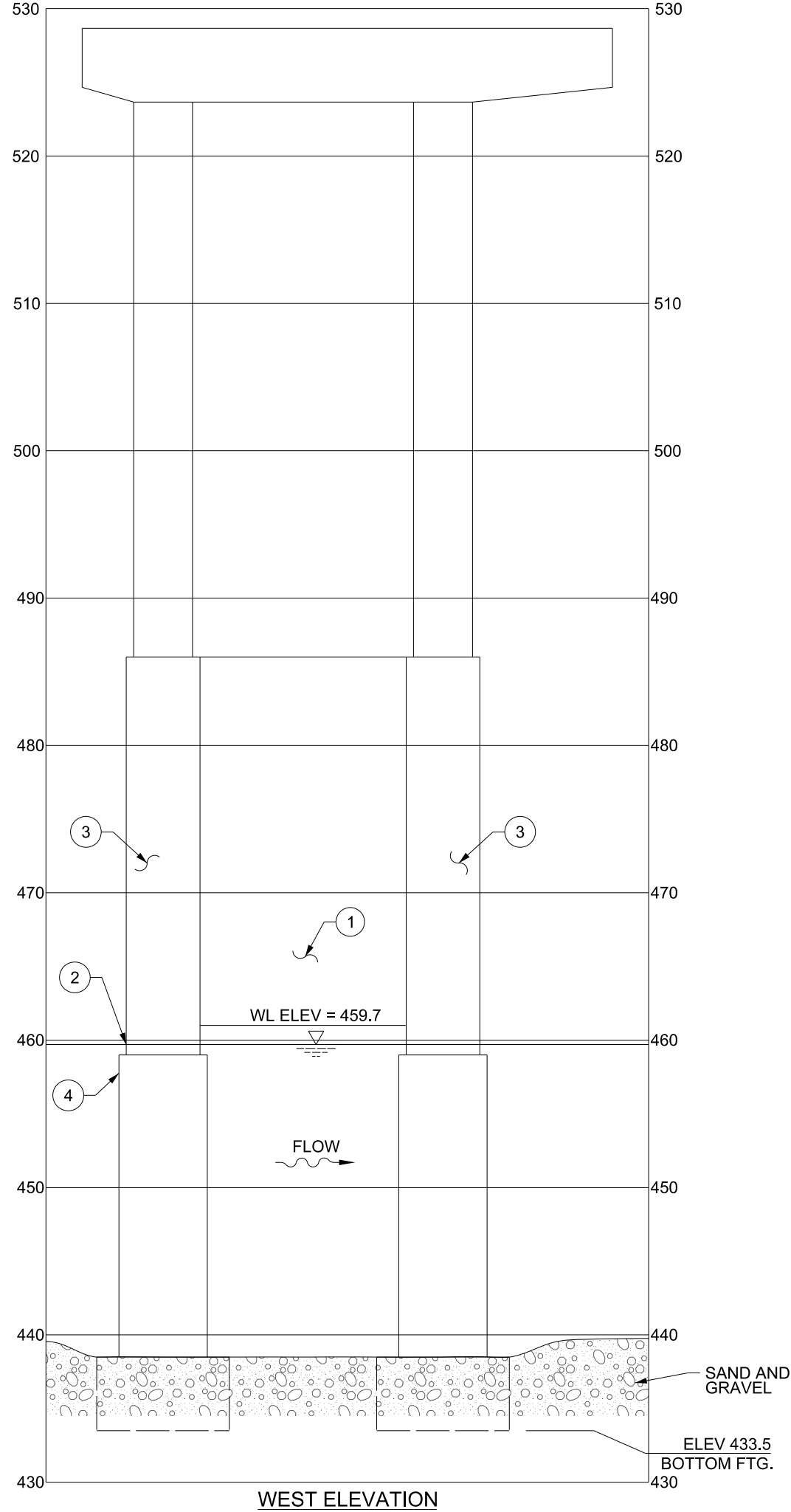
- GN. LIGHT ABRASION ON THE COLUMNS AND WEBWALLS RANGING FROM 1/16-IN DEEP TO 1/8-IN DEEP AND ALGAE GROWTH.
1. PIER WALL, INTERMITTENT VOIDING UP TO 5-IN H X 1-IN D AT RANDOM LOCATIONS.
 2. FOOTING, THE TOP SURFACE IS IRREGULAR.
 3. COLUMN/FOOTING INTERFACE, VOIDING AT THE DOWNSTREAM NOSE UP TO 3-IN H X 1/2-IN D.
 4. DOLPHIN, IMPACT DAMAGE TO THE NORTHWEST QUADRANT.



INSPECTION NOTES:

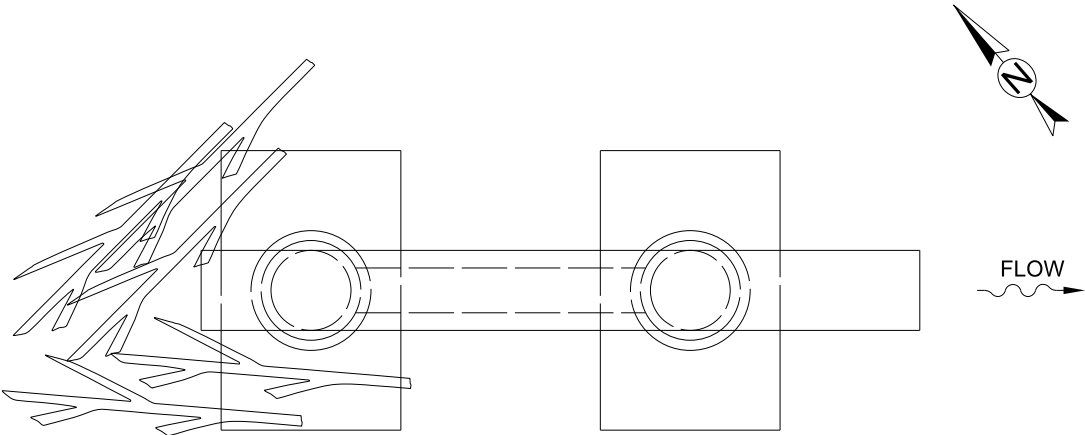
- GN. LIGHT ABRASION ON THE COLUMNS AND WEBWALLS RANGING FROM 1/16-IN DEEP TO 1/8-IN DEEP AND ALGAE GROWTH.
1. COLUMN 2, NORTH QUADRANT, EXTENDING FROM 2-FT ABOVE THE WATERLINE TO 7-FT BELOW THE WATERLINE, AREA OF SPALLING UP TO 48-IN W X X UP TO 2 1/2-IN D WITH ASSOCIATED MAP CRACKING UP TO 1/32-IN W WITH EFFLORESCENCE.
2. WEBWALL, WEST FACE, EXPOSED REINFORCING DUE TO LACK OF COVER.

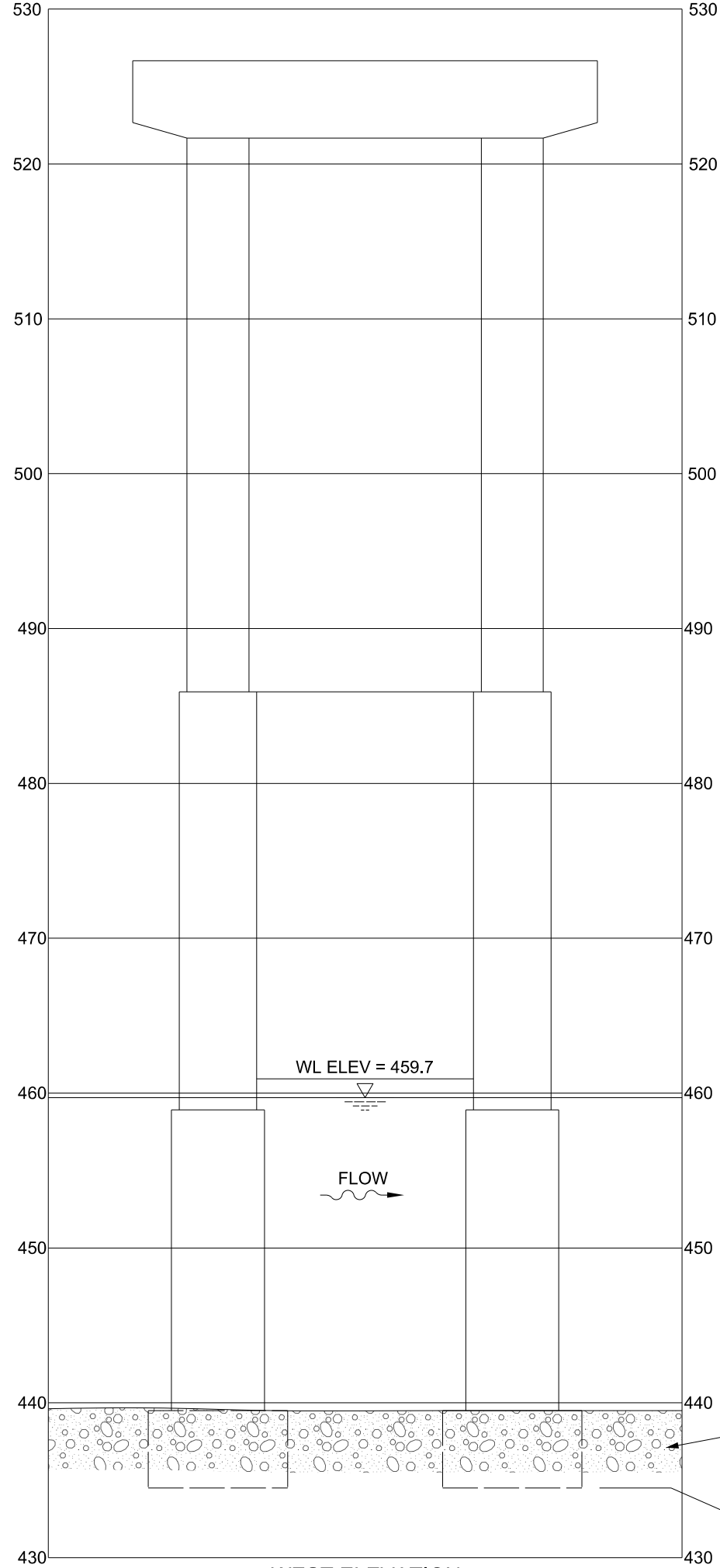




INSPECTION NOTES:

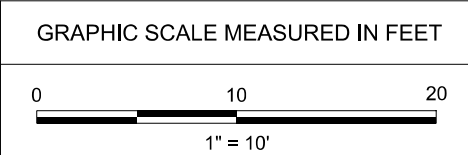
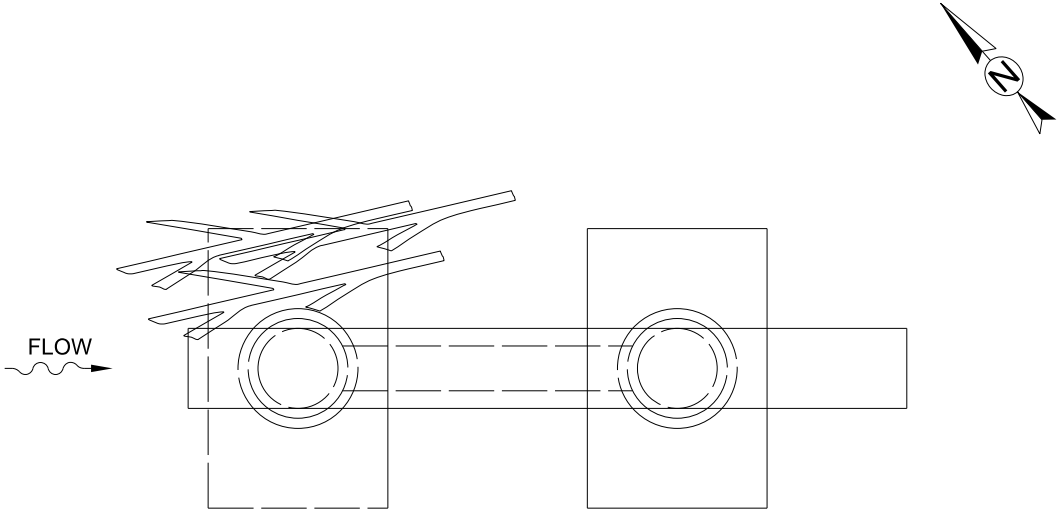
- GN. LIGHT ABRASION ON THE COLUMNS AND WEBWALLS RANGING FROM 1/16-IN DEEP TO 1/8-IN DEEP AND ALGAE GROWTH.
- WEBWALL, ABOVE THE WATERLINE, SHALLOW SPALLS WITH EXPOSED REINFORCING.
 - COLUMN 2, WEST QUADRANT FROM THE LOWER STEP OUT EXTENDING UP, SPALL 24-IN H X 18-IN W X 1-IN D.
 - BOTH COLUMNS, ALL QUADRANTS ABOVE THE WATERLINE, HAIRLINE VERTICAL CRACKS WITH EFFLORESCENCE.
 - COLUMN 2, UPSTREAM NOSE, 15-IN BELOW THE LOWER STEP OUT, SPALL 6-FT H X 6-FT W X 1 1/2-IN D.





INSPECTION NOTES:

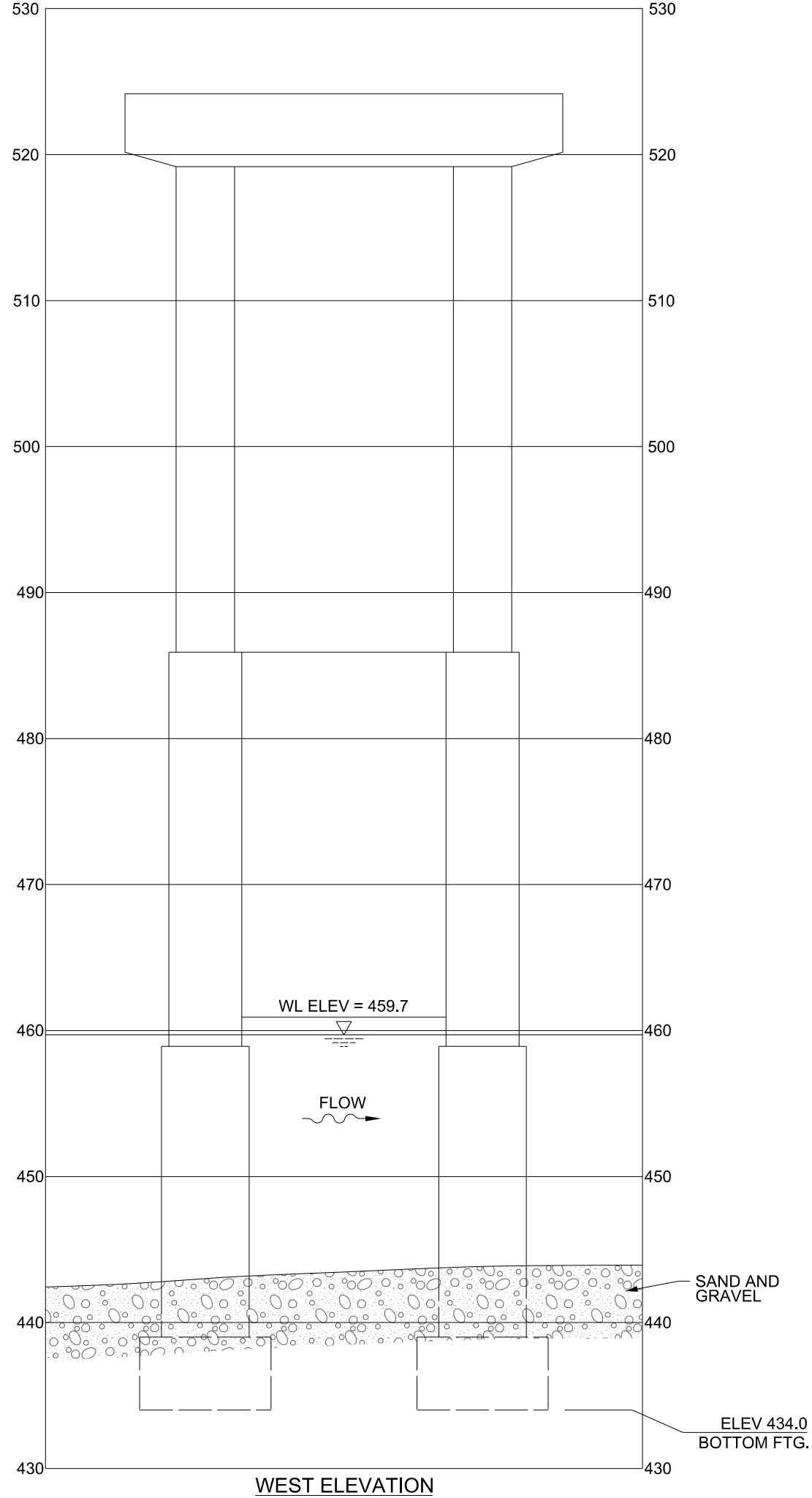
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DATE

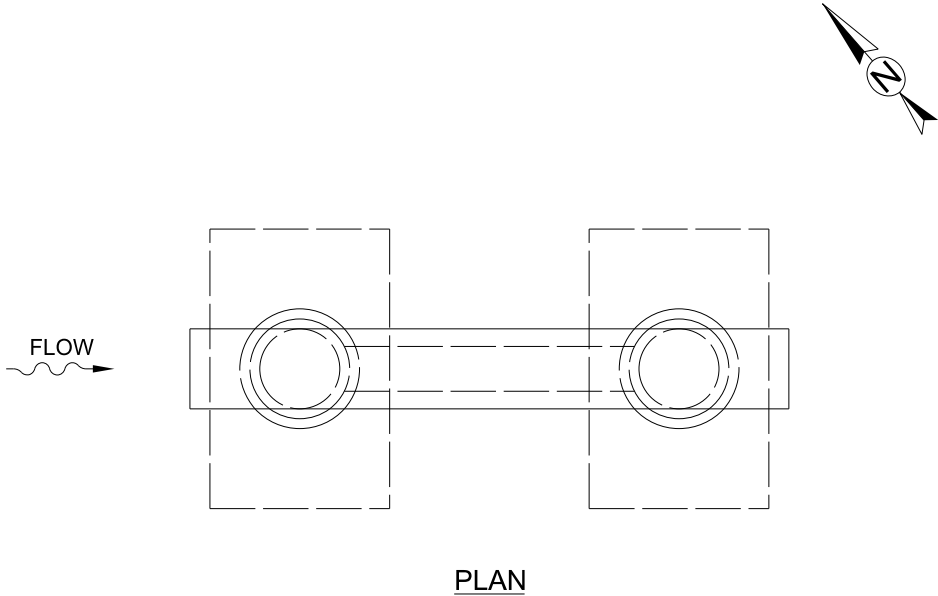
OCT, 2022

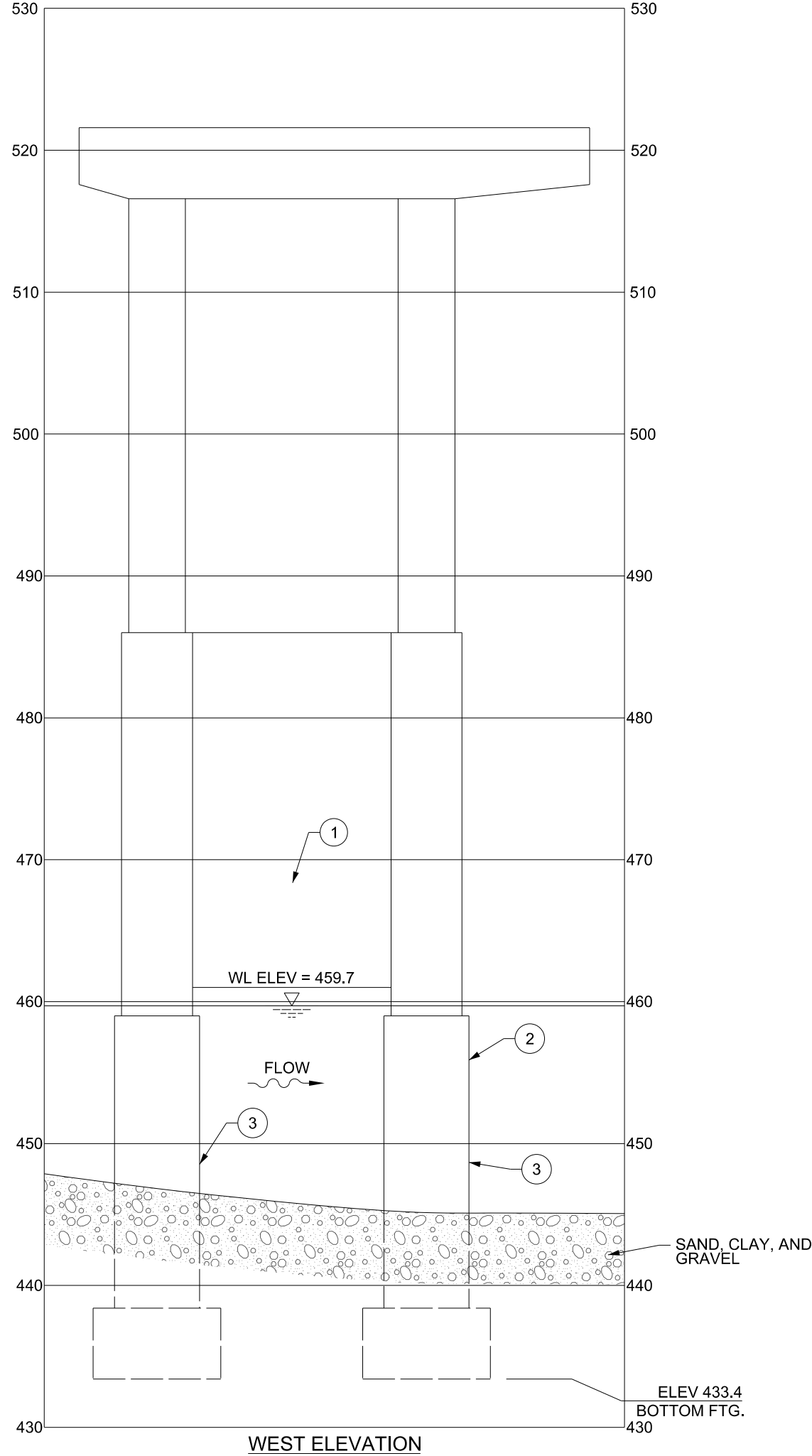




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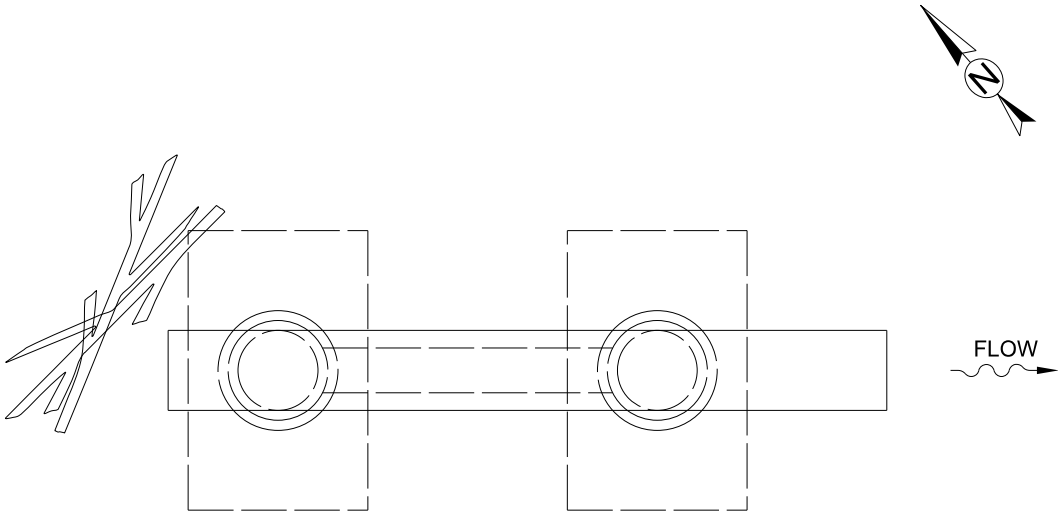
GN. LIGHT ABRASION ON THE COLUMNS AND WEBWALLS RANGING FROM 1/16-IN DEEP TO 1/8-IN DEEP AND ALGAE GROWTH.

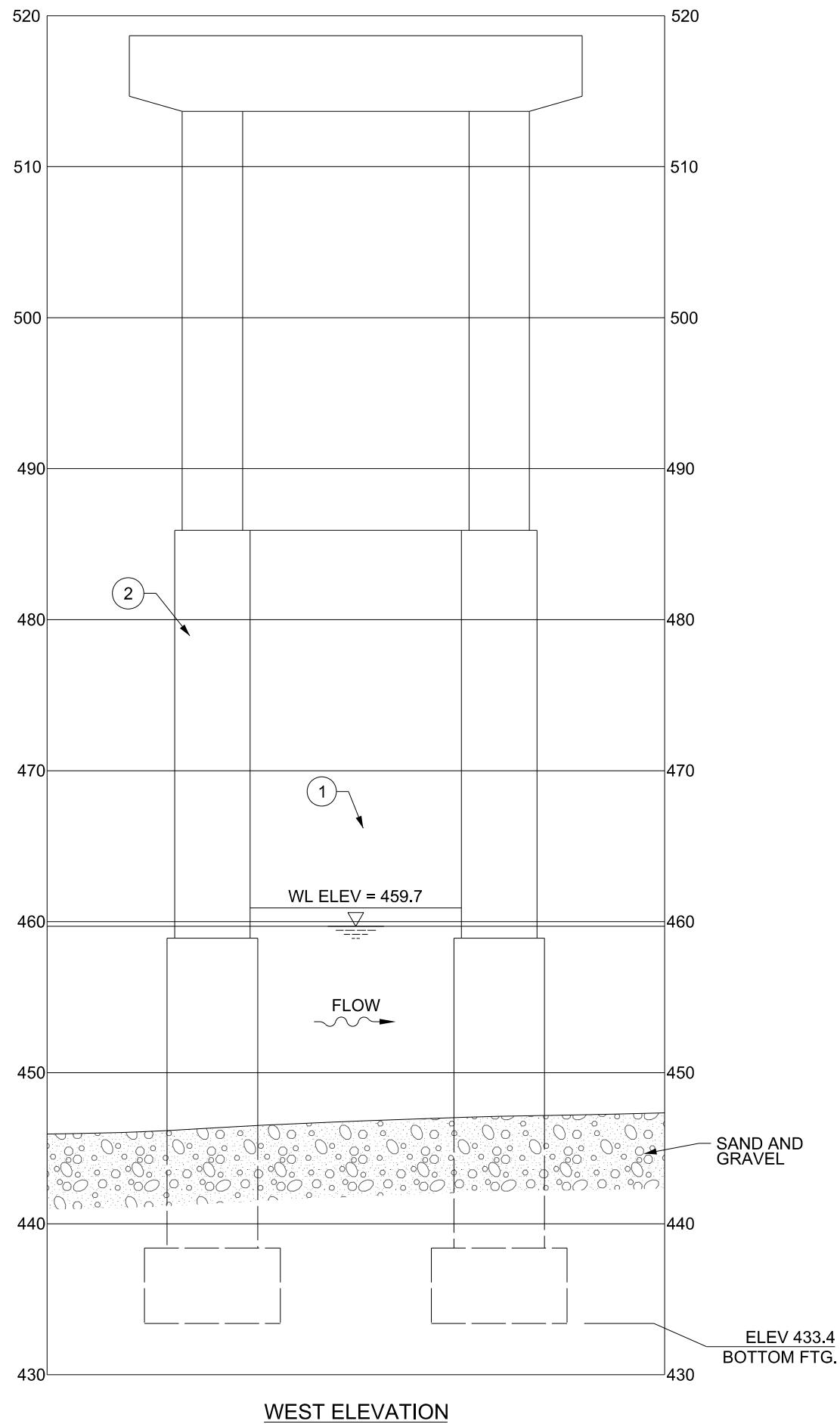




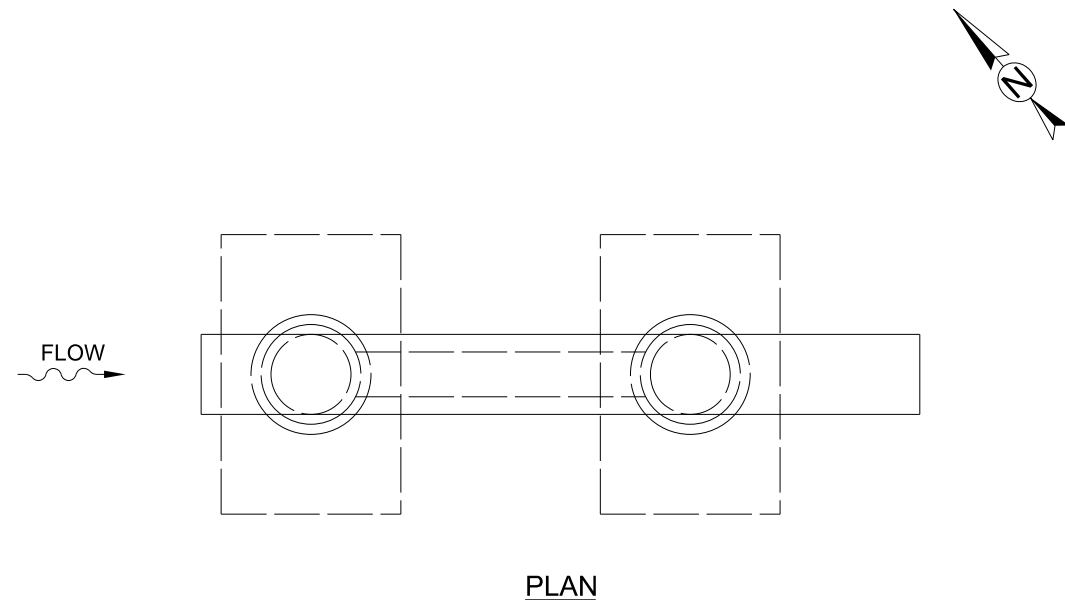
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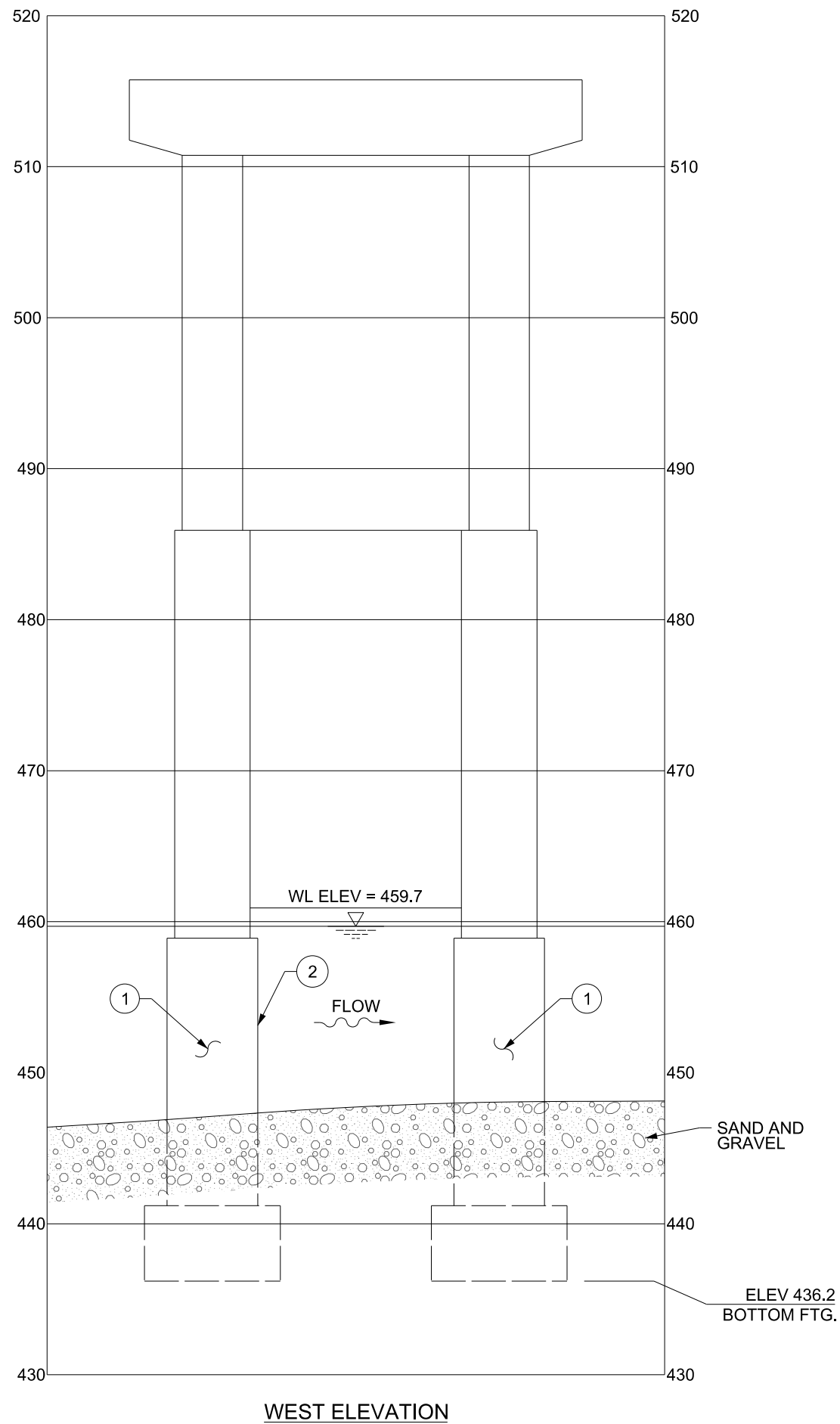
- GN. LIGHT ABRASION ON THE COLUMNS AND WEBWALLS RANGING FROM 1/16-IN DEEP TO 1/8-IN DEEP AND ALGAE GROWTH.
- WEBWALL, SHALLOW SPALLS WITH EXPOSED STEEL AT RANDOM LOCATIONS.
 - COLUMN 1, SOUTHWEST QUADRANT, FROM THE WATERLINE TO THE CHANNEL BOTTOM, VERTICAL CRACK HAIRLINE TO 1/16-IN W.
 - BOTH COLUMNS, AT THE SOUTHWEST QUADRANT, FROM THE WATERLINE TO THE CHANNEL BOTTOM, HAIRLINE TO 1/16-IN W VERTICAL CRACKS WITH EFFLORESCENCE.





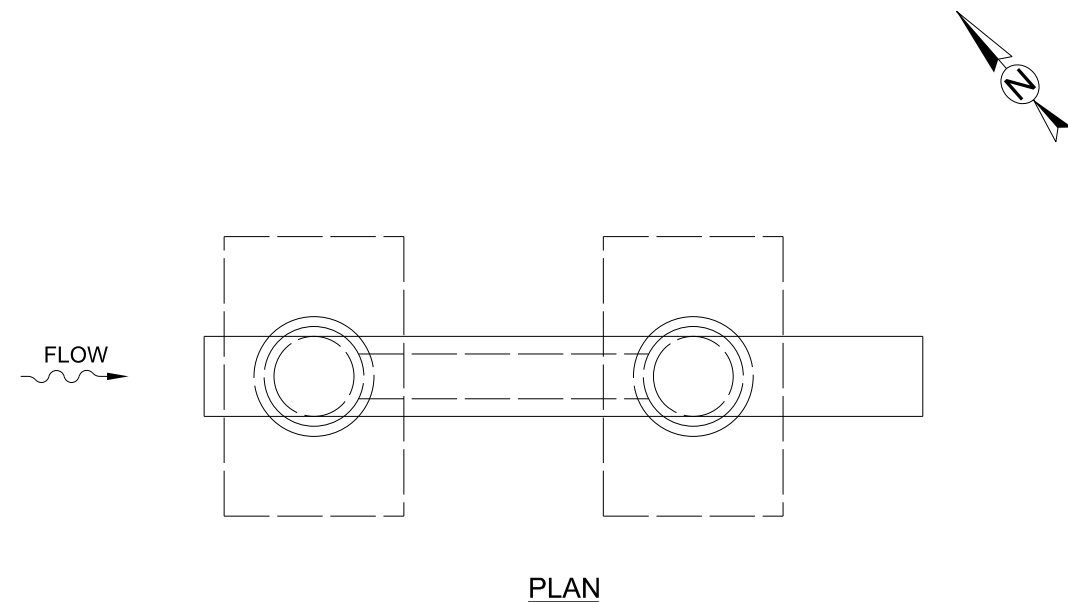
- INSPECTION NOTES:
- GN. LIGHT ABRASION ON THE COLUMNS AND WEBWALLS RANGING FROM 1/16-IN DEEP TO 1/8-IN DEEP AND ALGAE GROWTH.
1. WEBWALL, AREAS OF DELAMINATION AT RANDOM LOCATIONS NEAR THE HIGH WATERLINE.
2. COLUMN 2, EAST QUADRANT, 7-FT BELOW THE STEP OUT, SPALL 4-IN H X 2-IN W X 1/2-IN D.





INSPECTION NOTES:

- GN. LIGHT ABRASION ON THE COLUMNS AND WEBWALLS RANGING FROM 1/16-IN DEEP TO 1/8-IN DEEP AND ALGAE GROWTH.
1. BOTH COLUMNS, VERTICAL CRACKS HAIRLINE TO 1/16-IN W WITH EFFLORESCENCE.
 2. COLUMN 2, SOUTHWEST QUADRANT, STARTING 2-FT BELOW THE WATERLINE EXTENDING 11-FT BELOW THE WATERLINE, VERTICAL CRACK UP TO 3/16-IN W.



Oklahoma Dept. of Transportation

Underwater Bridge Inspection Report

NBI No.: 17611

Structure No.: 5159 0300 X

Local No.: -1

Description 4(100ft.CONT.)(207ft.-334ft.-207ft.CONT.)3(100ft.CONT.)4(100ft.CONT.)75ft. PLATE GIRDER S

Facility Carried : S.H. 100

No. of Main Spans 3

UW Insp Done Yes

Feature Intersecte ARKANSAS RIVER

No. of Appr. Spans 11

UW Freq. : 60

Location : SEQUOYAH C/L

Year Built : 1969

UW Next Date 10/14/2027

County : MUSKOGEE

Year Reconst. :

UW Last Insp. 10/14/2022

Temperature : 43

Structure Length : 1,928.2

Weather : Clear

Custodian : State

Substr. Cond. (U/W Satisfactory Condition

Owner : State

Scour Critical (i113 8 Stable Above Footing

General Inspection Notes

Channel Notes: The channel in the vicinity of the bridge has a slight bend and is well aligned with the piers. There are spur dikes on the east bank (outside of the bend), approximately 450-ft, 1400-ft, and 2700-ft upstream of the bridge. Both embankments are protected with dense vegetation. The embankments appear stable. There is light to moderate timber debris on the channel bottom at Piers 3, 4, 7, 8, 9, and 10; however, there are no significant restrictions to flow at the bridge. The channel bottom material at the piers consists of sand, gravel, and rock.

UW Inspection General Notes: The submerged portions of the substructure are in satisfactory condition. There is light abrasion on the columns and webwalls ranging from 1/16-in deep to 1/8-in deep and algae growth.

Below recommendations are from previous non-UW inspection

PX-

Replace rail post anchor bolts along the north barrier at the end of the east approach slab.

Unclog the deck scupper in span 10.

Reseal the fixed poured joint seal at both abutments.

Arrest girder web cracks via drilled holes that have not previously been arrested. See girder section for locations.

Repair cracked area at previous navigation light in girder 2 of span 6.

Replace or tighten bolts in the girders in spans 5;6;7.

Arrest crack on the exterior face of girder 1 in span 15: near pier 14.

Tighten loose stringer bolts at stringer to floor beam connections. See stringer section for locations.

Reattach floor beam 0 lower connection to girder 2 in span 6. Consider bolting the previously welded connection.

Repair cracked web connection plate weld for floor beam 6 in span 5 at girder 1.

Tighten and replace bolts at floor beam to girder connections. See floor beam section for locations.

Repair cracks for the lower lateral bracing in span 5; floor beam 7; girder 2 and span 6; floor beam 12; girder 2.

Replace severed lower lateral bracing hanger rods and missing connection brackets.

Tighten and replace anchor bolts at fixed bearings. See bearing section for locations.

FX-

Monitor spalls in the sidewalk of span 5; near pier 4.

Monitor the epoxy overlay for further deterioration.

Monitor the deck soffit along the girders, floor beams and stringers for further deterioration

Streambed / Scour Notes

There has been general scour ranging from 5-ft to 15-ft, west of Pier 8 since construction. The top of the footing at Piers 4, 5, 6, 8 and 9 are exposed; however, the footings are shown to be keyed into hard shale on the available plans and scour of the channel bottom material is not anticipated. Hands on inspection of the exposed footings are consistent with the footings being keyed into shale. Footing exposure is as follows:

Pier 4: The top of each footing is exposed. There is no vertical exposure.

Pier 5: The top of the footing is exposed with intermittent vertical exposure up to 4-in high along the west face.

Pier 6: The top of the footing is exposed but is 1-in to 6-in below the surrounding channel bottom.

Pier 8: The top of the footing is exposed but is up to 12-in below the surrounding channel bottom.

Pier 9: The top surface of Footing 1 is exposed at the downstream end only. The entire top surface of Footing 2 is exposed.

Recommendations

Clean and patch the spalls/voids that have exposed reinforcing steel.
Seal cracks greater than 1/16-in wide.

Oklahoma Dept. of Transportation
Underwater Bridge Inspection Report

NBI No.: 17611

Structure No.: 5159 0300 X

Local No.: -1

Abutment 1 ☐

Pier Group this report applies to : 1-15

| | Column-Footing No. 1 | Column-Footing No. 2 | Column-Footing No. 3 | Column-Footing No. 4 | Common Footing |
|---|---|---|---|---|--------------------------|
| Pier 1 | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> |
| Pier 2 | <input type="checkbox"/> 2 <input type="checkbox"/> | <input type="checkbox"/> 2 <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> |
| Webwall, exposed reinforcing due to insufficient cover. | | | | | |
| Pier 3 | <input type="checkbox"/> 2 <input type="checkbox"/> | <input type="checkbox"/> 2 <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> |
| Column 1, east quadrant at the waterline, area of voiding 12-in H x 3-in W x 2-in D. Column 1, east quadrant at the waterline, spall 3-in H x 3-in W x 1-in D. Column 1, south quadrant above the step out, void 4-in H x 4-in W x 3/4-in D. Webwall, west face above the waterline, shallow spalls | | | | | |
| Pier 4 | <input type="checkbox"/> 2 <input type="checkbox"/> 1 | <input type="checkbox"/> 2 <input type="checkbox"/> 1 | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> |
| Webwall, voiding up to 2-in deep on the bottom surface. Webwall, exposed reinforcing due to insufficient cover. | | | | | |
| Pier 5 | <input type="checkbox"/> 2 <input type="checkbox"/> 1 | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> |
| Column, northeast quadrant next to the lower step out, spall 3 1/2-in H x 9-in W x 2-in D. Footing, areas of abrasion on the top surface up to 1/4-in deep | | | | | |
| Pier 6 | <input type="checkbox"/> 2 <input type="checkbox"/> 1 | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> |
| Column, intermittent voiding up to 5-in H x 1-in D at random locations. Footing, the top surface is irregular. Column/Footing interface, voiding at the downstream nose up to 3-in H x 1/2-in D. Caisson dolphin, impact damage to the northwest quadrant | | | | | |
| Pier 7 | <input type="checkbox"/> 2 <input type="checkbox"/> | <input type="checkbox"/> 3 <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> |
| Column 2, north quadrant, 2-ft above the waterline, area of spalling up to 48-in wide x up to 2 1/2-in deep with associated map cracking up to 1/32-in wide with efflorescence. Webwall, west face, exposed reinforcing due to insufficient cover | | | | | |
| Pier 8 | <input type="checkbox"/> 2 <input type="checkbox"/> 1 | <input type="checkbox"/> 3 <input type="checkbox"/> 1 | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> |
| Webwall, above the waterline, shallow spalls with exposed reinforcing. Column 2, west quadrant, extending up from the lower step out, spall 24-in H x 18-in W x 1-in D. Both columns, all quadrants above the waterline, hairline vertical cracks with efflorescence. Column 2, upstream nose, 15-in below the lower step out, spall 6-ft H x 6-ft W x 1 1/2-in D | | | | | |
| Pier 9 | <input type="checkbox"/> 2 <input type="checkbox"/> 1 | <input type="checkbox"/> 2 <input type="checkbox"/> 1 | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> |
| No additional defects. | | | | | |
| Pier 10 | <input type="checkbox"/> 2 <input type="checkbox"/> | <input type="checkbox"/> 2 <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> |
| No additional defects. | | | | | |
| Pier 11 | <input type="checkbox"/> 2 <input type="checkbox"/> | <input type="checkbox"/> 2 <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> |
| Webwall, shallow spalls with exposed steel at random locations. Column 1, southwest quadrant, from the waterline to the channel bottom, vertical crack up to 1/16-in wide. Both columns, at the southwest quadrant, from the waterline to the channel bottom, hairline to 1/16-in wide vertical cracks with efflorescence | | | | | |
| Pier 12 | <input type="checkbox"/> 2 <input type="checkbox"/> | <input type="checkbox"/> 2 <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> | | |
| Webwall, areas of delamination at random locations near the high waterline. Column 2, east quadrant, 7-ft below the step out, spall 4-in H x 2-in W x 1/2-in D | | | | | |
| Pier 13 | <input type="checkbox"/> 3 <input type="checkbox"/> | <input type="checkbox"/> 3 <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> | | |
| Both columns, vertical cracks hairline to 1/16-in wide with efflorescence. Column 1, southwest quadrant, starting 2-ft below the waterline extending 11-ft below the waterline, vertical crack up to 3/16-in wide | | | | | |
| Pier 14 | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> | | |
| Pier 15 | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> | <input type="checkbox"/> <input type="checkbox"/> | | |

Abutment 2 ☐